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VETERINARY MEDICINE

features in this issue...

Atrophic Rhinitis of Swine

New Developments in Chemotherapeutic Agents

Treatment of Ear Conditions in Small Animals

Hormonal Hypothesis of Prepartum and Postpartum Acetonemia in Dairy Cattle

Clinical Studies on the Effectiveness of Terramycin in Large and Small Animals

Assay of Aureomycin in Milk by Use of Methylene Blue

The Blood and Plasma Bank

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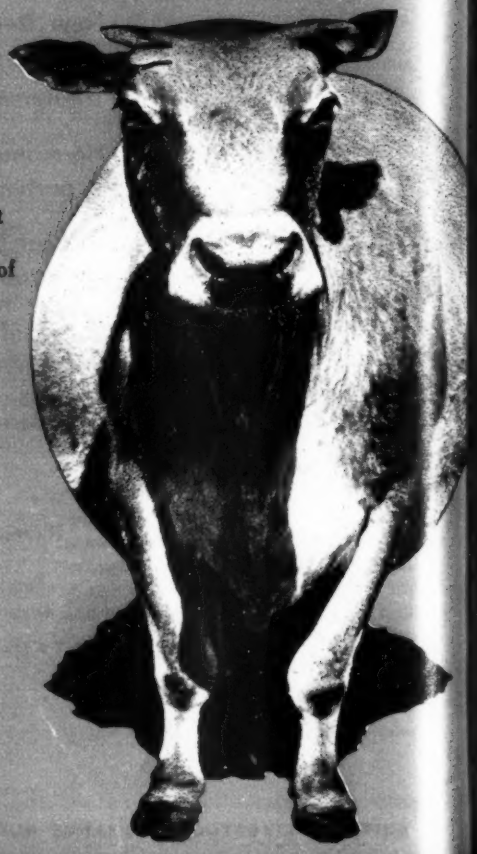

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Atrophic Rhinitis Of Swine

A. H. QUIN,* D.V.M., Kansas City, Missouri

INFECTIOUS atrophic rhinitis easily ranks as one of the most important disease factors which menaces the swine industry. The disease is insidious, damaging to profitable gains and easily carried to new herds (even by apparently normal or very lightly affected breeding stock). Its inroads have prompted many farmers to dispose of their herds and go out of the hog business.

In the United States, atrophic rhinitis presents a particularly difficult and perplexing control problem. Widespread traffic in swine through community sales and the seeming abandonment of orthodox disease control by officially authorized veterinary inspection and rigidly enforced quarantine, have already permitted widespread geographical distribution of this swine malady. In my own experience and within the past year, I have seen infectious atrophic rhinitis involving purebred herds in North Carolina, Georgia, Kansas and Missouri. The statement can be defended that the disease is well distributed from Ontario and Ohio on the east and throughout the swine belt states to Nebraska on the west, and from Minnesota to the Gulf on the south.

History

Historically speaking, this is no new disease. It has been recognized in Europe for some 70 years, where it has followed a more or less cyclic plan of enzootic morbidity. The malady has been especially prevalent in Denmark, North Germany, Poland, Sweden and Norway. Jensen,[1] of Denmark, published a report as far back as 1916.

One Canadian investigator contends that atrophic rhinitis was brought to America by importation of Danish Landrace breeding stock from Sweden. But, from whatever source, the disease has put some 40% of swine breeders out of business in one of the best swine-raising districts in Ontario.

Again referring to personal experience, I first saw the disease as a sneezing syndrome in baby pigs on a purebred Berkshire farm in central Indiana in 1938. At that time, nothing was known about the disease. Neither was there a bridge of understanding between the morbid sneezing of suckling pigs and the nasal distortion of shote-age and adult swine.

The first clear-cut report in veterinary literature is that of Doyle, Donham and Hutchings,[2] of Purdue, which appeared seven years ago. These authors stressed the apparent infectious nature of atrophic rhinitis and pointed out the importance of its differentiation from ordinary bull nose due to *Actinomyces necrophorus*.

Field Picture

The case histories of referred outbreaks are similar. Inquiry frequently reveals that the owner purchased breeding stock or pigs from outside herds, some time within the preceding three years. In accord with the usual pattern, incidence of sneezing baby pigs may be confined to only one or, at most a very few, of the litters at the first farrowing following the purchase of infected sows or boars. However, when the sneezing pigs grow to gilt age and are bred, there is a heavy incidence of "sneezers" among litters farrowed by these sows. There is little mortality among the sneezing suckling pigs but, during the stage from weaning to maturity there is slow growth, a variable incidence of pneumonia, a few deaths from encephalitis or meningitis and a drove-wide distribution of visibly defective snouts. A fairly constant symptom, especially noticeable in white breeds is a circular black area just below the inner canthus of the eye. An added and serious aspect is poor fertility of boars and gilts in badly infected herds.

Pathology

The pathological picture of infectious atrophic rhinitis is quite specific. An autopsy on a sneezing suckling pig reveals little except a variably swollen nasal mucosa with catarrhal exudate that may or may not be blood tinged.

In shote-aged pigs showing visible facial distortion, the lesions are best studied by cross-sawing the head midway between the tip of the snout and the eyes. Here is noted either marked shrinkage or complete disappearance of the rolled turbinate bones within the nasal vault on one or both sides. Further back, par-

*Head, Professional Service Division, Jensen-Salsbery Laboratories, Inc., Kansas City.

Fig. 1. Cross section, midway of the nasal bones, of the snout of a dressed hog, showing normal turbinates.

tial or complete resorption of the ethmoid bone may be evident. Within the nasal channel, variable amounts of pultaceous yellow exudate or, in long advanced cases, thickened or inspissated pus-like material, often blood tinged, is observed. In a majority of cases, completion of the autopsy reveals a septic, exudative type of pneumonia most common in the anterior lobes of the lungs. Purulent tonsils and cervical lymph glands are commonly seen. Animals which die with encephalitic symptoms show purulent involvement of the meninges and various segments of the brain.

These findings are in keeping with the observations of Phillips,[3] who has cited isolation of *Corynebacterium pyogenes* from 90% of the many rhinitis-infected shote tissues studied by him. Other secondary organisms isolated with comparative frequency are *Pasteurella suis, Alkaligenes bronchisepticus, Actinomyces necrophorus and Pseudomonas aeruginosa.*

Etiology

At present it must be stated that the specific causative agent of infectious atrophic rhinitis is unknown. Phillips,[4] and Schofield[5] and Jones, of Canada, have shown that:

1. Nasal discharges from affected swine have reproduced the disease when instilled into the nostrils of recently farrowed pigs.
2. That pigs infected in this manner readily transmitted the disease to litter mates.
3. That nasal instillation of feces and urine failed to reproduce the disease in susceptible pigs, and,
4. That all attempts to reproduce the disease with filtrates of infected tissues of known virulence have failed to transmit the disease. This rules out filtrable virus as the specific etiological agent.

Control

While all of the foregoing may be of academic interest, we realize that the chief concern is control and treatment. Treatment can be summed up by stating that nothing is known which will reverse the process of osseous atrophy and return bone structure to normal.

Obviously, the most important precaution is to warn owners of healthy herds about the disease and insist that they exercise all possible care in purchase of breeding stock. It is also a wise precaution to isolate all feeder pigs away from contact with brood sows or especially sows with young pigs.

All sows and pigs should be identically earmarked. If any "sneezers" show up in litters less than a month old, the entire litter should be destroyed and the sow sent to slaughter and not to the community sale.

If one or more sneezing litters are detected, all sows with healthy litters should be moved

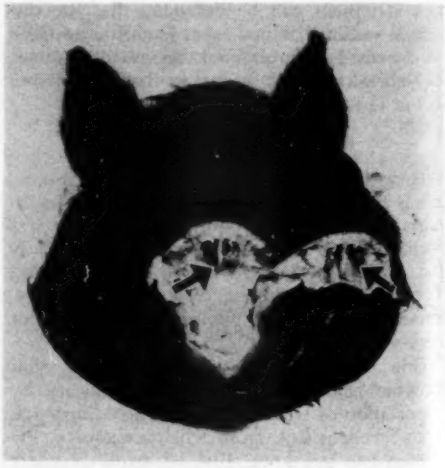

Fig. 2. Atrophic rhinitis, advanced. Cross section of the snout of a purebred Hampshire gilt; end of snout turned back to show both sides of cut section. This animal, farrowed August 16, 1950, weighed 142 lb. on April 22, 1951, approximately one-half that expected of such a gilt at eight months of age. Aside from symptoms of stunted growth and light weight, sneezing was the only symptom noted. There was no deviation of the snout. Arrows indicate nearly complete disappearance of nasal turbinates. Photograph and case history courtesy Dr. W. W. Wempe, Lawrence, Kansas.

from the central hog house to individual houses on clean pasture.

All shote-age pigs showing even the slightest nasal deflection, or dishing, should be destroyed. Any brood sows or boars showing any abnormality of nasal contour should be sent to slaughter. This includes any adult swine which show either unilateral or bilateral nose bleeding even though there is no visible abnormality of the snout.

If the disease is detected early, it appears possible to retain adult sows or boars and get rid of replacements only. On the other hand, if the disease is in the second or third year of the cycle and its distribution is heavy, it is probably advisable to sell off the entire infected herd for slaughter only.

It is always advisable to disinfect hog houses with hot lye water or cresol whenever infected sows and litters have been isolated.

It may be emphasized that possibly the greatest danger with infectious atrophic rhinitis is that it may be spread to new herds by breeding stock which is apparently normal and in perfect health. Until such time as specific tests are available which will sort out diseased or carrier animals, control should be placed on the same basis as glanders, anthrax, foot-and-mouth disease, and other contagions which are a public menace.

Summary

Infectious atrophic rhinitis of swine is widely distributed in Canada and the United States. New droves are infected by contact with purchased replacements. The disease is characterized by a sneezing syndrome in baby pigs with subsequent atrophy of the turbinates and ethmoid bones. The etiological factor is not a filtrable virus but can be transmitted to susceptible pigs by infected tissues or contact exposure. Known infected animals should be sent to slaughter. All litters containing sneezing pigs should be destroyed. Original breeding stock may be retained if the disease is detected early in its course. This disease merits the same official control as is accorded anthrax, glanders and other contagions.

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Four Million Dairy Cows Now in Artificial Breeding Associations

More than 4,000,000 dairy cows in nearly 500,000 herds are now registered in associations for artificial insemination. About one out of every six dairy cows in the United States probably will be inseminated artificially in 1951, according to USDA reports.

On January 1, 1951, there were 4,077,706 cows in 467,224 herds in 1,653 associations, according to Dr. J. F. Kendrick, head of the Division of Dairy Herd Improvement Investigations in the Bureau of Dairy Industry. This is an all-time high; compared with the previous year, it is an increase of 44.2% in the number of cows and 25.3% in the number of herds.

These associations are now operating in 47 states, Alaska, and Puerto Rico.

Wisconsin leads for the ninth consecutive year with 797,513 cows enrolled. New York is second with 322,443 cows; Minnesota is third with 294,740 cows; Illinois is fourth with 284,329 cows; and Ohio is fifth with 276,235 cows enrolled.

Of the 2,104 bulls in service in 1950, 538, or about one-fourth of them, were proved sires. They were proved on the basis of DHIA records, and their daughters averaged 432 pounds of butterfat.

There has been a spectacular rise in the average number of cows served by each bull in the associations due to research and practical application of insemination technic.

▼ ▼ ▼

World Food Supplies Inadequate

The Department of Nutrition of the National Live Stock and Meat Board, in a recent statement, calls attention to the fact that the present food supplies in the world are inadequate. Of the total population, estimated at 2,300,000,000, two-thirds suffer from malnutrition.

In view of the fact that the world population is increasing at the rate of 22,000,000 per year, it is self-evident that the food supply must be increased. Meat holds an important place because it is the prime source of high quality protein. The veterinarian is a vital cog in the machinery geared for efficient meat production. Removal of the present limitation imposed by disease challenges the best of professional efforts.

New Developments In Chemotherapeutic Agents

LEWIS E. HARRIS,* M.Sc., F.A.I.C., Lincoln, Nebraska

The decade just past has witnessed phenomenal development of effective chemotherapeutic agents. In no other field of medicine has comparable progress been made. Development of these chemical agents continues at a rapid pace. New products are continually under trial and new uses are being found for the oldest of these.

It is forecast that within ten years veterinary practitioners will be using antibiotics and other chemotherapeutic agents now unknown. As these find their useful place, and a wider variety is available, selection for specificity, depending on the bacterial invasion, may be possible.

In the accompanying article, the author considers only the antibiotics now in general use in veterinary medicine. Part II of this paper, dealing with other new agents, will be presented in a subsequent issue of VETERINARY MEDICINE. A reference list will append part II.

DURING the past decade, there has been a radical change in the type of chemotherapeutic agents employed in both veterinary and human medicine. At least two large pharmaceutical manufacturers recently have completed surveys which show that since 1940 over two-thirds of their sales have been in products developed since that time; while another firm reports that 55% of the 1948-49 sales were of products introduced during the past five years[1]. Antibiotics, sulfonamides, endocrines, vitamins, and certain synthetic products now constitute the majority of chemotherapeutic agents sold and most of these were unknown 15 years ago. This rapid advancement has resulted in marked changes in therapeutic measures employed in veterinary medicine. New and improved products, together with modifications in methods of treatment, have been and continue to be reported so rapidly that it becomes difficult for the busy practitioner to keep informed of such advances. A review of recent developments may be of value.

Much could be written concerning the history and development of sulfonamides, antibiotics, endocrines and certain synthetic drugs but, while this is very interesting, it is generally well known and has no practical value. Further, the routine use of these, and other newer drugs is well known and discussions of them serve no useful purpose. Therefore, this paper will be generally restricted to discussion, in outline and summary form, of the newer chemotherapeutic agents or new and unusual applications of the older products.

PART I—THE ANTIBIOTICS

Penicillin

This antibiotic has been so widely used that its properties, uses and dosage are generally well known. One of the newer aspects of penicillin is the development of procaine penicillin which is a chemical combination, not a mixture, of procaine and penicillin. This new compound is slowly hydrolyzed after intramuscular injection with the result that a prolonged blood level of penicillin follows a single injection. Procaine penicillin is usually prepared in an oil vehicle with a small amount of aluminum stearate added. A single injection of suitable size will maintain therapeutic blood level concentrations for 24-48 hours, although many practitioners prefer to repeat doses every 12 to 24 hours to be certain of a satisfactory blood level.

The majority of all penicillin used in veterinary medicine is for treatment of mastitis. Some preliminary investigations have indicated that penicillin-bacitracin in ointment form may have excellent application for udder infusion in mastitis control.

Dosage. The average dose of crystalline penicillin G in aqueous solution is 2,000 units per lb. body weight administered every three or four hours. Procaine penicillin in oil is recommended according to the following schedule: small animals, 150,000 to 300,000 units; medium-size animals, 300,000 to 900,000 units; large animals, 1,000,000 to 3,000,000 units; every 24 hours.

Note. Labels on penicillin products for veterinary use are required to bear the word "Veterinary" by the Food & Drug Administration since such labels bear directions for veterinary use. It should be emphasized, however, that the penicillin marked "Veterinary" and that sold for human use is identical in purity, potency and all other respects. As a matter of fact, a part of a single large batch

*Director, Pharmaceutical Research and Control, Norden Laboratories, Lincoln.

of penicillin may be labeled with directions for human use, and a part for veterinary use.

Streptomycin

This drug became available shortly after penicillin. It has advantages of increased effectiveness against Gram-negative pathogens. However, it now appears that chloromycetin is even more effective than streptomycin in the treatment of such infections. Streptomycin is administered parenterally in aqueous solution. Doses should be repeated every three to four hours. It is not absorbed nor destroyed in the gastrointestinal tract. A disadvantage in its use is in the tendency for many organisms to develop resistance to it very rapidly. It is important that an adequate dosage be used at all times to minimize the possibility of development of resistance to invaders. It is ineffective in bovine tuberculosis, glanders, anthrax, rabies, and in Salmonella and Streptococcus infections.

Veterinary Uses and Dosage. Vigue[11] obtained satisfactory response in calf pneumonia from administration of 0.25 gm. in 5 cc. saline intravenously four times daily for four or five days. The use of 0.25 gm. per day, in divided doses, subcutaneously, for 20-30 lb. dogs and one-half this amount for cats is recommended by Kellberg[12] for treatment of low grade bacillary infections which commonly complicate distemper cases. Acute nephritis in a Wire-haired Terrier was controlled by use of 0.2 gm. initially, followed by 0.2, 0.1, and 0.1 gm. at three, six, and nine hour intervals, respectively; then 0.1 gm. four times daily for three days[13]. Lipman[14] reported excellent results in treatment of cases of *E. coli* mastitis. A dose of 0.5 mg. per lb. body weight at three hour intervals produces satisfactory blood levels in horses. Combinations of 50,000 units of both dihydrostreptomycin and penicillin in ointment form was found very effective in both specific and mixed infections of mastitis, with "cures" ranging from 88 to 100%[14]. Grumbles and Bovey[15] report good recovery in infectious sinusitis in turkeys following injection of 100 mg. streptomycin directly into the sinus.

Chloromycetin*

The scope of action of chloromycetin is extremely broad; Rickettsia, certain viruses, bacilli, staphylococci, streptococci, gonococci, pneumonococci, Brucella, and certain Salmonella. It is seven to 36 times as active as penicillin, and two to 16 times as active as streptomycin against Gram-negative organisms tested[9]. While it is produced as a growth product of an organism (*Streptomyces venezuelae*), it is unique in that it is the first antibiotic to be produced synthetically on a commercial scale. The product is nontoxic as is evidenced by studies in which dogs have been given 50 to 100 mg. per kg. body weight twice daily by oral dosage for periods up to 133 days, during which time no toxic symptoms developed.

Veterinary Uses. The supply of chloromycetin has been somewhat limited until recently, and therefore very few clinical reports of its use are available in veterinary literature. A few practitioners have employed this agent in treatment of secondary complications of canine distemper, panleukopenia of cats, and acute staphylococcic mastitis, with good results. In view of the clinical work in human medicine, it is reasonable to assume that chloromycetin might be valuable for any condition in which other antibiotics have been found effective. Limited studies have suggested that it may be of value against avian pneumoencephalitis.

Dosage. The adult human dose, in acute and chronic conditions, is 50 mg. per kg. body weight per day, in divided doses and continued until symptoms of disease have abated. Then the dose is reduced to 25 mg. per kg. body weight per day, also given in divided doses. Interval between doses should be at three, four or six hours, omitting night dose. However, the interval between doses should never be longer than eight hours[10].

Aureomycin**

This is one of the newer antibiotics. It has been used successfully in the treatment of bacterial infections due to organisms of the coli-aerogenes group, streptococci, pneumococci, staphylococci, Brucella, and Friedländer's infections. It is particularly interesting to note that aureomycin is also effective in the control of rickettsial diseases and at least a few viral diseases such as psittacosis and lymphogranuloma venereum. Generally speaking, it is effective for the treatment of a wider range of infections than is penicillin and has the further advantage in that suitable blood levels can be maintained easily by oral administration. Toxicity of aureomycin is of a low order when given *per os;* dogs receiving 100 mg./kg. exhibit no evidence of chronic toxicity. The antibiotic is generally considered irritating when injected intraperitoneally, intramuscu-

*Parke, Davis & Company, Detroit, Mich.

**Lederle Laboratories Division, American Cyanamid Co., Pearl River, N. Y.

larly, or subcutaneously. A 0.5% solution in physiological saline is only mildly irritating when dropped into the eye[5]. Aureomycin *per os* may be contraindicated in ruminants since it destroys the bacteria flora; intravenous or intraperitoneal administration has been suggested[28].

At the 1950 spring meeting of the American Chemical Society, Stokstad and Jukes told of the discovery that aureomycin, in addition to its curative properties, is a potent growth accelerator. Experimental work that has been completed with chicks, turkeys and pigs indicates that the addition of about 12 mg. per lb. of feed will produce favorable growth effect. More recently, it has been demonstrated that the same results are obtained from the use of other antibiotics, including penicillin, terramycin, and streptomycin. It is not now known whether the superior weight gains are due to a growth stimulation action or to the suppression of pathogenic organisms.

Veterinary Uses. Aureomycin has been used principally in treatment of mastitis. McCulloch, *et al.*,[3] report 50% "cures" in 24 quarters infected with staphylococci, following intramammary infusion of an ointment containing 100 mg., while 200 mg. per quarter produced 85.7% "cures." The use of 5 gm. in 500 cc. water, intravenously, followed by 2.5 gm. in 250 cc. water every 12 hours for three to four days resulted in recovery of one serious case of acute staphylococcic mastitis, according to Easterbrooks[4]. On the other hand, Packer[20] used two doses of 200 mg. each in *Staphylococcus aureus* mastitis with 68.5% "cures," but found aureomycin of no value in *Escherichia coli* infection. Preliminary studies by Brunner and Meyer[5] indicate that 40 mg. per kg. body weight *per os* prevents development of carriers of leptospirosis. Dolin[6] has recently published an interesting note concerning the apparent removal of multiple warts (caused by filtrable virus) in man, by administration of 4 gm. of aureomycin. This drug failed to arrest the disease or modify its usual course in experimental treatment of acute brucellosis of cattle[29]. Prier[21] found that 15-50 mg. per lb. body weight increased survival rate 50-80% over untreated controls in *Pasteurella multocida* infections. He also reported that injection of 50 mg. into sinuses eliminated swelling in eight of 13 turkeys suffering from natural infections of infectious sinusitis, but intramuscular injection of 100 mg. did not alter the symptoms or lesions in 17 naturally infected birds[22].

Dosage. Chronic mastitis; 200 mg. in ointment per quarter as udder infusion, repeated once or twice at 48-hour intervals. No general dosage has been established for veterinary use; however, the use of 1 to 1.5 gm. per 100 lb. body weight per day, in divided doses, for four days has been suggested. The human dose is usually 25 mg. per kg. of body weight every 24 hours, divided into four equal doses.

Bacitracin†

This antibiotic has many excellent qualities but has enjoyed only limited veterinary acceptance. It generally is not used parenterally and is more suitable for topical application or local infiltration. Its greatest value is its ability to obviate the need for surgery in many pyogenic lesions which formerly required incision and drainage. Observations of Meleney[7] indicate that a favorable response is obtained in a significantly higher percentage of patients than is possible with other antibiotics administered by local infiltration. Many cocci are resistant to penicillin, but susceptible to bacitracin.

Veterinary Uses and Dosage. Very good response has been observed in treatment of acute and subacute otitis externa in dogs by first cleaning the ear canal, followed by filling the canal with bacitracin ointment (500 units per gm.), using an ear applicator tube. Bacitracin ointment is also suggested in the treatment of all surface lacerations and wounds as a prophylactic measure. Bacitracin in aqueous solution is used for local infiltration in localized infections by injecting 0.2 to 5 cc. (500 units per cc.) into the center of the infection. In open lesions, such as infected and nonhealing wounds and ulcers, local therapy is best applied by wet dressings (500 units per cc. concentration) once or twice daily.

A recent report by Konde[8] and Rose[27] suggests the use of 10,000 units of bacitracin *per os* twice daily for three or four days in the treatment of diarrhea in dogs. Thirty-four cases of hemorrhagic enteritis, distemper enteritis, and chronic colitis were treated with good response in all except two cases. This suggests the possible use of bacitracin in swine enteritis, infectious calf scours and similar conditions at such time as the cost is reduced. Rose[27] has found the use of 1,000 units bacitracin per kg. body weight per day, administered intramuscularly, for three to five days, to be effective for systemic infections in which sulfonamides and penicillin are ineffective. Bacitracin in 50,000 to 100,000 unit oral doses daily for six days gave excellent results in serious outbreaks of swine dysentery[26]. Heish-

†C.S.C. Pharmaceuticals, Division of Commercial Solvents Corp., Terre Haute, Ind.

man[35] reports the use of 50,000 units bacitracin plus 0.2 gm. subtilin is not superior to other agents now used for bovine mastitis.

Terramycin††

This is the newest antibiotic available commercially. It shows promise of being most satisfactory for all purposes. Supplies of this new drug are limited at present and reports of clinical use in veterinary medicine are meager. However, production is rapidly increasing and quantities are being made available for veterinary use.

Terramycin base is a crystalline compound only slightly soluble in aqueous fluids. The readily soluble hydrochloride is the form which will be used generally. In this state it is readily absorbed, giving rise rapidly to effective blood levels which may be maintained continuously by oral administration at six-hour intervals. The antibiotic is transferred promptly from the blood to other tissues of the body. Terramycin is a relatively nontoxic antibiotic when administered by the oral route[18]. No toxicity is observed when 0.16 gm. per kg. body weight is administered intramuscularly to dogs. Daily intramuscular or oral dosage of 40 to 80 mg. per kg. body weight for seven weeks produces no neurotoxicity in cats.

Welch, *et al.*,[10] compared terramycin with aureomycin and showed that the two antibiotics are quite similar in their antibacterial spectra following oral dosage in man. A relatively marked increase in blood concentrations occurs with an increase in the dose of terramycin, but such increase is not as pronounced with aureomycin. The cumulative urinary excretion and concentration in the urine at any given time was greatest for terramycin.

Clinical evaluation work indicates terramycin can be used for any condition in which penicillin, aureomycin or chloromycetin has been effective, and is more satisfactory for certain conditions. Further, it shows some promise of broader antiviral spectra. It has been used in common infectious conditions of large and small animals — shipping fever, pneumonias, primary and secondary bacterial complications of distemper, generalized infections of the upper respiratory tract, ear infections, urinary infections, feline infectious rhinitis, and secondary bacterial complications of feline panleukopenia. In human medicine, terramycin has been used successfully in the treatment of gastrointestinal infections (dysentery from Shigella, amebiasis, and general bacterial infections) and this suggests its use in the treatment of certain types of enteritis in animals.

Dosage for small animals is a total of 25 to 50 mg. per lb. body weight per day, orally, divided into three or four doses. Use 5 mg. per lb. body weight per day, intravenously, total divided into three or four doses. Continue dosage for two to four days. The dosage for large animals has not been definitely established, but some investigators have used a single dose of 1 mg. per lb. body weight, intravenously, repeated in 24 hours.

(*To be continued*)

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Periodicity of Microfilaria in Dogs

It is desired to take exception to some statements made by Burch and Blair in their article, A Rapid Test for the Diagnosis of *Dirofilaria immitis*, appearing in VETERINARY MEDICINE for April 1951, page 128.

They state, "Since the infected dogs in this series were tested morning and afternoon with equally good results, the need of nocturnal sampling is unnecessary to demonstrate the parasite." Their published material gives no basis for making this statement since they made no nocturnal sampling and therefore do not know whether the negative tests included in their data might not have been positive if nocturnal samples were taken.

Apart from this rather rash conclusion Burch and Blair ignored rather conclusive evidence of periodicity during the day as demonstrated by Schnelle and Young (*The Bulletin of the United States Army Medical Department*, September 1944). In taking samples, Burch and Blair chose 8:30 a.m. and 3:30 p.m., two times of day which have been demonstrated to be low points in the peripheral circulation of microfilariae in war dogs. Schnelle and Young established a pattern of periodicity which followed the same course in four dogs kept under the same routine. It was demonstrated that in a measured amount of serum one dog had a count of one at 8:00 a.m., a negative count at 11:30 a.m., a count of four at 3:00 p.m., and a count of 189 at 4:30 p.m. Another dog had a high count of 482 microfilariae per 0.1 cc. of serum at 4:30 p.m., which dropped to ten at 9:00 p.m.

It would seem both unjustifiable on the basis of data submitted and unwise for Burch and Blair to intimate that the periodicity factor is not significant.—*Gerry B. Schnelle, V.M.D.*

††Chas. Pfizer & Co., Brooklyn, N. Y.

Treatment Of Ear Conditions In Small Animals

ALVIN D. KAPLAN, B.A., D.V.M., Arlington, Massachusetts

A LARGE number of the cases presented daily to the practicing veterinarian pertain to anomalies of the ear canal. It is in the treatment of these that practitioners often have the opportunity to impress the owner, through genuine concern and interest, as well as sympathy for the patient, and by alleviating pain.

There are no steadfast rules as to which breed or type of cat is more susceptible to such troubles even though the greatest number of cases are tom cats. Among dogs, the most extensive ear pathology is encountered in the long-ear breeds where air to the canal is limited by ear flaps. A more or less closed cavity is thus formed that may foster the growth of parasites, bacteria, and molds on the lining of the ear canal. Unless such organs are checked at regular intervals, collection of exudates and debris results. Drainage is impossible. Eventually these exudates and products of parasitic invasion increase in severity with accompanying symptoms of a diseased external ear.

Symptoms

A mild irritation with symptomatic restlessness, shaking of the head, continuous scratching at the ear with the paw, holding down the affected side, rubbing it along the ground and against objects are initial symptoms. Finally there appear inflammatory areas about the external orifice as a result of the mechanical irritation and due to excessive scratching. The appearance of inspissated cerumen, which soon collects, fills in the ear, causing such irritation, and sometimes such a foul odor, that it is obvious this organ is intensely inflamed and desperately in need of immediate treatment and relief before further complications arise. Many veterinarians have their own theories and favored treatment for various manifestations, but be it otitis media, otitis externa, a mere inflammatory condition, traumatic otitis, parasitic otitis, acute ulcerative otorrhea, chronic ulcerative otorrhea, or some sort of allergic otitis, the essential and immediate treatment is relief of the associated pain.

Relief of Pain

To struggle with an animal, dog or cat, while the ear is being cleansed of either just plain wax or a mass of purulent bloody matter is foolhardy and extremely poor practice. It may lead to further damage and make an extremely poor impression on the client. All inflammatory processes of the ear are painful and should not be treated indifferently, but rather with sympathy, concern, and consideration, to prevent unnecessary suffering. To bring about prompt, effective relief it is recommended to resort to the use of fast-acting local anesthetic agents. Such aqueous solutions as metycaine® (Eli Lilly and Company), procaine, or butyn® (Abbott Laboratories) are suggested. With the use of any one of these, pain may be reduced to a minimum.

All breeds of cats are highly susceptible to ear mite infestation due to Otodectes cynotis var. felis. Severe infestations of long standing result in inflammatory lesions.

Treatment

Most of the exudates, crust, and debris are removed by various methods of irrigation and cleansing. The writer does not advocate nor use any oils to loosen hardened or dried exudates because of the danger of irritation due to formed plugs that may result from such practice. The use of oils, and oil-like preparations in drop form, is considered too dangerous for the temporary relief it affords.

Through careful elimination and numerous case studies, a few medications are now employed that are useful agents and well tolerated. One such preparation, auralgan,® (Doho Chemical Corp.), a water-free glycerol containing antipyrine and benzocaine, has proved its value in the treatment of all types of aural conditions. By its rapid decongestant, dehydrating and analgesic action, it quickly brings about relief of pain and visible inflammation. In numerous cases, a preparation of auralgan with chlorophyl has been used to allow for increase in tissue healing when necessary in cases of chronic suppurative otitis media. In itself, the preparation has been useful in loosening and liquefying congested matter 15 to 20 minutes after introduction into the canal; facilitating easy removal of detritus with as little discomfort to the patient as is humanly possible.

Of prime importance in the treatment of diseases of the external ear canal is the removal of accumulated exudates and relief of associated pain.

Auralgan has been an important adjunct to sustaining temporary anesthetic relief afforded by the quick acting procaine or butyn used during treatment. It has never failed to please the owner, comfort the animals, and bring a great deal of satisfaction to the writer. Home use is continued as long as is necessary, and in both dogs and cats suffering from either acute or chronic otitis, the preparation has always answered its purpose as an analgesic. In the author's large cat practice it is used in place of the older types of ear medicants where phenol is incorporated as an ingredient.

The following case histories are interesting in that they are examples of the type of ear conditions that confront the veterinary practitioner in routine work.

Case 1. A nine-month-old, male cat was presented as an emergency. Actually examination revealed a chronically infected ear, as evidenced by a discharge from both ears, some mutilation of tissue due to scratching and a bloody discharge. The lining of both ears was raw, the canals full of matter, and the entire region sensitive to the touch. As much of the freely movable debris as was present was removed and auralgan cotton packs (cotton soaked in auralgan) inserted. After a brief time, the cotton packs were removed; the cat seemed more restful, which permitted a better examination. Ears were then cleaned as thoroughly as possible and four or five drops of auralgan and then an equal quantity of otosmosan® (Doho Chemical Corp.) (sulfathiazole and urea in chemical combination and incorporated into a completely dehydrated glycerol base) were instilled into the canals, and the cat was dismissed with home medication. Four days later, the animal was returned for examination, at which time improvement was noted. According to the owner, the cat was more playful and rarely, if at all, scratched or rubbed the ears.

Case 2. A six-month-old, male Cocker Spaniel developed a painful ear condition with accompanying purulent discharge during convalescence following an attack of distemper. The ear was cleaned thoroughly with dry cotton after auralgan was instilled to alleviate pain. As much of the exudates as was possible to remove were cleaned out and a mixture of auralgan with procaine penicillin G in aqueous suspension dropped into the canal. This was repeated morning and night for two days, at the end of which time the ears were again treated and found to be much cleaner, the dog less sensitive and the objectionable odor relieved. It may be stated here that the writer has seen many such cases. During a siege of distemper or pneumonia, ear complications have arisen similar to those observed in human practice.

Case 3. An eight-month-old, male terrier was brought to the office for treatment of both ears which had been bothering him for about three weeks. On examination the canals were found to be highly inflamed, raw, and very sensitive to touch. Auralgan was dropped into the ears and the local anesthetic effect enabled further examination which revealed abrased walls of the outer canal as if some foreign object, such as a stick, had been probed into the organ. The owner agreed that such was possible for on various occasions a child in

the family had used a lolly-pop stick in such a fashion. Auralgan was dispensed and the condition cleared up within two to three days.

Case 4. An eleven-year-old, spayed Cairn Terrier was presented with a history of chronically infected ears. Both were purulent and gave the dog a great deal of discomfort. Both canals were filled with auralgan and as soon as the sensitivity seemed alleviated, the debris and matter were removed with swabs; until it was felt that the remaining material was not soft enough for safe removal. At the owner's request, the animal was made an ambulatory case and sent home with a mixture of auralgan and otosmosan, equal parts, for home instillation. On the return examination a great deal of improvement was noted. The dog was now resting more comfortably and was more at ease as evidenced by very little scratching or head shaking. The dispensed mixture was used for about a month by the client whenever the chronic infection flared up, as the mixture immediately reduced both inflammation and discomfort.

Case 5. A three-year-old, female Newfoundland was brought to the office for treatment of a long neglected case of "canker" of both ears. The linings of the ears were badly inflamed. A purulent discharge was present. Immediate relief was afforded by flooding both canals with auralgan and as soon as sensitivity had disappeared as much debris as could be removed safely was disposed of. A mixture of otosmosan and auralgan was instilled and retained by inserting cotton plugs. These were removed in about 20 minutes. The dog was dismissed with medication. The owner later claimed that the animal was miraculously improved and continued to be more at ease. About three months later, the ears were re-examined and even though some inflammation was evident suggesting further treatment, this was considered to be due to the owner's neglect.

Case 6. A six-month-old, male English Setter was admitted for treatment following an automobile accident. After a thorough examination little was noted except a slight bit of blood escaping from the ear on the injured side. The canal was raw and torn through some freakish accident which caused the animal to hold the head down and shake it continually. A mixture of auralgan and 1:1,000 epinephrine solution soaked in a cotton plug was inserted into the ear canal and allowed to remain for about 20 minutes; after which it was slowly and carefuly removed. On re-examination of the canal, and it can be stated that the animal began to hold the head level and ceased to shake it, the bleeding had stopped and the sensitivity was relieved. Only auralgan was dispensed for home application. Three days later the owner advised that the dog was fine and that his ear was not giving any trouble.

Case 7. A three-year-old, female Cocker Spaniel was examined for ear trouble. The client did not advise us of any previous treatment, but on examination a very foul odor was noted. The membrane lining of the canal was extremely reddened. On advising the owner of our observation, he admitted that home treatment for the last week or so had consisted of dropping "mange medicine" into the ear canal. An auralgan-butyn mixture was instilled and the ear rubbed continuously for 15 minutes, after which the dog was dismissed with a supply of the same mixture.

Conclusion

Treatment employed for ear anomalies is generally palliative. Relief of pain is the prerequisite before successful therapeutic methods can be employed. In the foregoing, the writer has attempted to show how essential and simple analgesic agents make an otherwise distasteful task lighter and relieve excruciating pain frequently accompanying inflammatory processes of the external ear canal, from many causes.

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Intravenous Procaine in Equine Tetanus

Intravenous injection of 100 to 150 cc. of a 2½% solution of procaine hydrochloride once daily for two days, then every other day for an additional two or three doses, has been followed by improvement in most cases of tetanus in horses and mules. No other therapy was used. Dr. Charles C. Burn, Thomasville, Ga., (*Jour. Am. Vet. Med. Assn.*, 118:325 [May], 1951) reports that this treatment gives lasting relaxant action. Results from its use have made possible an increase in recoveries.

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No Dog Pound

There is no dog pound in the city of Yuma, Ariz. The radio station acts as mediator between lost and found dogs and those interested in obtaining dogs. They do not charge for this service. Needless to say, it is one of the popular spots on the radio station.—*Kennel Crier.*

Hormonal Hypothesis Of Prepartum And Postpartum Acetonemia In Dairy Cattle*

GUILLERMO PUNTRIANO, D.V.M., M.S., Ithaca, New York

PART I

Practitioners have experienced varied success in the treatment of acetonemia in dairy cows. Some cases recuperate without treatment; others respond to well known regimen; while still others regress in spite of every known treatment.

The answer, states this author, is that various cases of acetonemia have diffferent etiology. The hypoglycemic condition, which is a common symptom complex present during ketosis, could have its primary origin in a hormone imbalance or from functional aberration of the pancreas, liver, or kidney, or from a nutritional factor or factors.

This hormonal hypothesis, as an explanation of metabolic anomalies, of which acetonemia in cattle is classic in veterinary medicine, is based on much investigation into the physiology of the endocrine system. It well may lead into a more comprehensive understanding of the interrelationship of those minute factors (hormones) so vital to healthy body function.

Suggested hormonal treatment for acetonemia in lactating cows is given in detail, including the separate or combined use of ACTH, adrenal extracts (cortisone and desoxycorticosterone), estrogens, and gonadotropic hormones, in accordance with the etiology of the condition observed in individual animals.

The complete discussion by Doctor Puntriano will appear in three parts; parts II and III to follow in subsequent issues. A detailed reference list will be published with part III.

THIS hypothesis postulates the insufficiency of cortical steroid hormones from the adrenal cortex as one of the main causative factors in the development of acetonemia in dairy cattle.

The insufficiency of both groups of hormones, the glucocorticoids (corticosterone, cortisone, and related compounds having an atom of oxygen on carbon-11) and mineralocorticoids, to supply the physiologic adjustments at postpartum when the period of lactation starts, is thought to be due to one or to a combination of the following alterations:

1. Level of the biologically active estrogens in the circulating blood in concentration below the "physiological threshold ratio" prevalent during lactation, as a result of an ovarian dysfunction.
2. Exhaustion of the adrenal cortices.
3. Abnormal function of the anterior lobe of the pituitary gland in its output of either follicle stimulating hormone (FSH), prolactin, or adrenocorticotropic hormone (ACTH).
4. Genetic factors associated to a great functional development of the mammary gland.

Acetonemia or ketosis is considered to be a symptom of a metabolic disturbance resulting from a derangement of carbohydrate metabolism[1]. Hypoglycemia is one of the main alterations. This latter condition is usually associated with an abnormal accumulation in the blood of the so-called ketone bodies (acetoacetic, beta-hydroxy-butyric, acetone) which initiates the clinical picture of the condition known as acetonemia.

The two main characteristics of ketosis which could support the belief that the adrenal cortex plays a predominant role in the development of that metabolic disturbance are:

1. The hypoglycemic condition. The metabolism of carbohydrates is controlled by various physiologic mechanisms, of which the glucocorticoid hormones from the adrenal cortex are one. It has been shown that cortical insufficiency causes hypoglycemia in certain mammals[2].

2. The frequent incidence of acetonemia during the lactation period and its similarity to a condition which results from the failure to elicit a temporary or permanent physiological adaptation. In the latter condition, the adrenal cortex function is undoubtedly involved. This similarity may be correlated by citation to earlier work.

According to Selye[3] the "general adaptation syndrome" is the sum of all non-specific reactions of the body which ensue upon long continued exposure to stress (noxious agents). It involves three distinct stages: "alarm reaction," "stage of resistance" and the "stage of exhaustion."

Using the same criteria, the name "physiological adaptation" could be applied to the

*This paper was presented to the veterinary staff of Cornell University in May 1950.

sum of specific, systematic reactions of the body which succeed the development of a "physiological stress," such as pregnancy, parturition, lactation, etc. It also would involve the three distinct stages, as pointed out above.

Acetonemia in dairy cows could be considered as the condition which results from the failure to ensue of a proper physiological adaptation when the period of lactation starts. The three distinct stages of an improper adaptation in ketosis could be differentiated as follows:

(a) Failure to elicit normal response to the alarm reaction. According to Long[4] the alarm reaction involves the event of physiological responses to stress conditions, elicited through the epinephrine-hypophysis-adrenal cortex defense mechanism. The failure to evoke normal response to alarm reaction could have, therefore, its etiology in a functional abnormality of the adrenal cortex or the anteropituitary.

(b) The stage of resistance in which the acetonemic condition is developing and no clinical symptoms are manifested as yet.

(c) The stage of exhaustion in which the clinical symptoms of acetonemia are openly manifested.

In this paper, the role assigned to estrogens in the development of ketosis is due to its so-called "corticomimetic" effects[5]. It has been determined that some of the natural and synthetic estrogens exert certain physiologic effects similar to those exerted by the steroids of the adrenal cortex. For this reason, estrogens have come to be regarded as corticomimetic in their actions.

There is evidence to support the concept that estrogens encourage the release of ACTH from the anteropituitary and that this latter hormone stimulates the adrenal cortex, thus causing it to release its hormones in amounts larger than normal[6,7]. This causes an increased stimulation of the gluconeogenesis function of the liver which finally would result in an increase of blood sugar. This latter result is in accord with the findings of Zunz and LaBarre,[8] which indicates an increased blood sugar in dogs as a result of estradiol administration. Also, it has been reported[9] that after adrenalectomy, or after the adrenals were tied off,[6] the injection of estrogens does not raise the blood sugar in rats or dogs. These findings suggest that in the intact animal the secretion of adrenocortical hormones may be conditioned indirectly by the output of estrogenic hormones from the ovaries, and in turn, this mechanism could be regarded as playing an adaptive role in certain physiological stresses, such as lactation. The relationship between estrogenic output and ketosis will be discussed later in the paragraph on ovarian dysfunctions.

From this review, it appears that a normal body calls upon its two main mechanisms of defense against stress conditions; namely, alarm reaction and corticomimetic effect of estrogens and, in turn, the efficiency of these mechanisms is dependent upon normal endocrine function of the adrenal cortex, ovaries and anterior pituitary glands.

In the particular case of acetonemia of dairy cattle, two main physiological stress conditions will be considered; namely, pregnancy and lactation. Additional stresses, such as unfavorable environment, pathological pregnancy, dystocia, several types of diseases, etc., would cause exhaustion of the adrenal cortices and this would upset the mechanisms of defense. Conversely, a cow which suffers from a deficiency in its mechanism of defense would show a failure to physiological adaptation (adrenocortical insufficiency) during pregnancy and lactation.

It will be explained later in this article why, according to our hormonal hypothesis, acetonemia in cows develops mainly after parturition when the period of lactation starts, in spite of the fact that a deficient corticomimetic mechanism could exist during pregnancy.

For the sake of clarity, therefore, prepartum and postpartum acetonemia will be discussed separately after a previous discussion of insufficiency of cortical steroids as responsible for ketosis.

Insufficiency of Cortical Steroid Hormones as Causative Factors in the Development of Acetonemia in Dairy Cattle

Insufficiency of cortical steroids refers to a condition in which the hormonal output of the adrenal cortex is inadequate to meet the demands of a stress condition, or to supply the necessary adjustments to a particular biologic circumstance of the body.

The adrenal cortex could be in high or low activity, but the term "cortical insufficiency" could be applied to both conditions when the demands of the body are not properly satisfied in certain functions.

A cortical insufficiency may be considered as "primary" in the development of ketosis, when the output of cortical steroid hormones is below the normal rate to maintain a normal lactation; as secondary when the cortical steroid output is sufficient to maintain a normal lactation but not an excessive milk secre-

tion. In both cases, hypoglycemia would develop as a result of certain special characteristics in the metabolism of carbohydrates in the cow, which will be discussed later.

The primary insufficiency could have its main origin in a hormonal imbalance such as a hypo-ovarian follicular secretion and exhaustion of the adrenal cortex; the secondary, in conditions associated with hypo-ovarian follicular secretion, genetic factors or with increased stimulus from suckling or milking. The mechanism of development of these cortical insufficiencies will be discussed in the pertinent part of those causative conditions.

That acetonemia in cows is mainly a clinical picture of primary or secondary cortical insufficiency will be shown by interpreting its clinical manifestations as caused by insufficiency of gluco- and mineralohormones of the adrenal cortex.

Two main symptoms are manifested in acetonemia, namely hypoglycemia and decreased milk secretion. The increase of ketone bodies in the blood is a consequence of the hypoglycemic condition. That is why it would be preferable to call an acetonemic condition hypoglycemia.

Primary Cortical Insufficiency

From their studies showing that adrenal cortical activity affects the metabolism of fat as well as carbohydrates and protein, Stoerk and Porter[9] postulate that adrenal insufficiency may result in a decreased utilization of amino acids which causes a compensatory increase in the rate of utilization of carbohydrate and fat. Since the carbohydrates are more easily oxidized than fats (Krebs and Johnson[10]) and since a decreased utilization of amino acids (decreased gluconeogenesis function) is postulated during adrenal insufficiency, it is deducible that in this latter condition, hypoglycemia and ketonemia would appear.

The development of hypoglycemia and acetonemia in lactating cows as a result of a primary cortical insufficiency may be discussed separately.

Hypoglycemia. When the output of glucocorticoid hormones (corticosterone, cortisone, and related compounds having an atom of oxygen on carbon 11) is below the normal rate to maintain a normal lactation (average or high milk producing cow), the manifestation would be a hypoglycemic condition. This would occur by considering first, the function of the glucocorticoids as regulators in the metabolism of carbohydrates, and second, the dominant role of these hormones in maintaining a normal blood sugar level in ruminants.

An analysis of these factors is: (1) The glucocorticoids are hormones responsible for the mobilization of body proteins and the promotion of gluconeogenesis from them (Long, *et al.*[11]). They also stimulate the glycogenetic function of the liver and favor the intestinal absorption of glucose (Brownell and Hartman[12]). In adrenocortical insufficiency these functions are altered and hypoglycemia results (Zwemer and Sullivan[3]).

(2) It has been shown that ruminants normally maintain their blood glucose level largely through gluconeogenesis. Only a relatively reduced amount of carbohydrates is provided directly by the digestive tract. In fact, dietary carbohydrates are largely fermented by the bacteria of the rumen, which convert them into certain lower fatty acids; these are absorbed into the portal circulation from the rumen. A small portion of the dietary carbohydrates escapes from the conversion to the lower fatty acids by bacterial fermentation and enters the lower portion of the gastrointestinal tract to be digested and absorbed as monosaccharides and to become a source of blood sugar (Dye and McCandless[13]).

The intestinal source of carbohydrates in ruminants may be further reduced during adrenocortical insufficiencies. This situation, added to a decreased gluconeogenesis and an increased utilization of carbohydrates, which occurs during cortical insufficiency (Stoerk and Porter[9]) would result in a significant hypoglycemia in cows.

A hypoglycemic condition would precipitate the body to further metabolic disturbances. Since the total energy requirements of the body are derived mainly from the oxidation of carbohydrates (Soskin[14]), in hypoglycemia the organism would maintain its source of energy constant mainly by an increase in fat metabolism. The latter disturbance in the metabolism of fats is in accord with the findings of Stoerk and Porter[9] during adrenal insufficiency. Since the carbohydrates are more easily oxidized than fats (Krebs and Johnson[10]), an increased utilization of the latter would result in accumulation of ketone bodies in the blood. When this accumulation is in significant amounts, it would give rise to the condition known as acetonemia.

Decrease in Milk Production. This is the symptom which would result from a deficient output of both glucocorticoids and mineralocorticoids. The first group of hormones would decrease the availability of milk precursors, as far as carbohydrates, proteins, and fats are

concerned. The second group would alter the normal supply of water, sodium, chlorine, and postassium ions.

Undoubtedly, a decrease in milk secretion could be considered as a tendency of the body to adjust to an inadequate elaboration of cortical hormones. This would cause, to a certain extent, a relief of the hypoglycemic condition and disappearance of ketosis. In other words, the cow would recuperate without treatment.

If there is no reduction in milk secretion or if there is an increase due to possible hormonal imbalance (decreased production of ACTH may stimulate the synthesis of prolactin by the acidophil cells of the anteropituitary—see abnormal function of the anterior pituitary gland; increased release of prolactin as a result of hypo-ovarian follicular secretion —see ovarian dysfunctions), the symptoms of ketosis would be accentuated and serious complications could develop.

Before concluding the consideration of the primary cortical insufficiency, the writer would like to point out two main observations connected to hypoglycemia in ketosis.

1. It is noticeable that there is an increased hypoglycemia effect of insulin since elevated doses of dextrose injected intravenously during ketosis, disappear rapidly from the blood. This could be explained by the antagonistic effect of corticosterone and insulin. Decreased titers of corticosterone would increase the hypoglycemic effect of the insulin.

2. A deficient output of glucocorticoids would increase the capacity of carbohydrate utilization in the muscle. This could result in muscular asthenia. The prostration and fatigue shown by a cow during acetonemia would be the manifestation of this latter alteration.

The first and second condition added to a decreased gluconeogenesis function, would cause a marked fall in blood sugar, especially during the increased metabolic activity concurrent with lactation.

Miscellaneous Symptoms. A decrease in the appetite would be a manifestation of a primary cortical insufficiency. Responsible for this symptom would be, mainly, a decreased metabolic rate prevailing during that endocrine condition. A decrease in food intake would create in the cow a fasting condition which would favor the development of hypoglycemia.

The symptoms of gastritis, pneumonia, metritis, etc., which sometimes accompany ketosis, would be the consequence of a decreased resistance of the body to stress conditions, summated to an altered metabolism of carbohydrates, fats, and proteins.

Nervous symptoms during acetonemia are considered to occur by an irritating stimulus of the ketone bodies on the nervous system.

Digestive disturbances, such as diarrhea or constipation, could be interpreted as caused by an abnormal mineralocorticoid output which would alter the distribution of water and sodium in the body.

Secondary Cortical Insufficiency

The mechanism which causes hypoglycemia during so-called secondary cortical insufficiency is distinct from that which causes primary cortical insufficiency; since during the former condition, we assume a normal adrenocortical function which becomes incapable of maintaining excessive lactation.

A functional disproportion between the mammary gland and the adrenal cortex observed in certain genetically selected cows, would be an example of this type of insufficiency. The excessive lactation observed in these cows, would demand increased precursors of milk, of which the carbohydrates are one of the most important. In the cow, the carbohydrates would be easily depleted from the blood, since the normal glucose level in this animal, is characteristically low as compared to other animals. If the normal output of glucocorticoids from the adrenal cortex cannot respond adequately to the increased requirements in carbohydrates for milk formation (secondary cortical insufficiency), the result would be hypoglycemia which would develop ketosis.

Increased stimuli from suckling or milking, as well as conditions associated with hypo-ovarian follicular secretion, may develop the same metabolic disturbances when they increase the lactation in significant amounts.

An acetonemic condition as a result of secondary cortical insufficiency could be aggravated with the development of a primary cortical insufficiency. This may happen as follows: Whenever there is an excessive lactation in the cow, increased output of prolactin by the anteropituitary is required; in accordance with our hypothesis (see abnormal function of the anterior pituitary gland) an increased production of prolactin by the anteropituitary would cause a decreased synthesis of ACTH by the acidophil cells of this gland; in turn, reduced amounts of ACTH would not stimulate the adrenal cortex sufficiently to produce its hormones in quantities adequate to maintain an increased lactation. Obviously, the acetonemic condition would be aggravated by a primary cortical insufficiency.

(To be continued)

Clinical Studies On The Effectiveness Of Terramycin In Large And Small Animals

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EVERY practitioner is familiar with the economic aspects of shipping fever and pneumonia in cattle. Probably the greatest losses are seen in western cattle brought east for dry-lot feeding. In almost every shipment, several cattle are lost due to the extremely infectious nature of the condition commonly called "shipping fever."

This report, of field use of terramycin in the treatment of shipping fever and pneumonia in western cattle shipped to this area, indicates the value of this newer antibiotic. Information is included on the treatment of mastitis, and several cases of canine distemper and pneumonia in small animals.

Results with terramycin have been good. Only one case of pneumonia or shipping fever in cattle in our practice has been lost since this drug has been used. The most remarkable experience is the rapidity with which animals return to normal and start eating.

Treatment with several capsules of terramycin has been used in an effort to stop deaths in the so-called baby pig disease complex (gastroenteritis), but no favorable results were observed. All treated pigs died. One affected sow, mother of sick pigs, was given the agent intramuscularly. Pain produced by the injection was great, but the animal quieted down in about ten minutes. She did not recover any sooner than those untreated.

Terramycin capsules were employed on four newborn calves with navel septicemia. Disease in this group was advanced and all died within 12 hours. It is the opinion of the writers that terramycin might be useful in such cases if treatment were begun in the early stages of the disease process. It is felt that this antibiotic would be of value in the relief of calf scours. Further study is suggested to verify these possibilities.

Terramycin was first used by us intravenously after procaine penicillin and sulfamethazine or sulfathiazole and supportive drugs failed to give satisfactory results. This treatment appeared to give excellent results, but required an abnormally extended period in several cases to effect a satisfactory outcome. In these instances, the effects of previous medication may have been limiting. The following report of cases presents more of the details. It was decided to use terramycin on all cases of hemorrhagic septicemia and pneumonia in cattle as soon as symptoms were noticed.

Dosage

Dosage rate for intravenous injection was not established when trials were initiated. A study of available literature revealed little of a clinical nature of the use of terramycin for control of the diseases of large animals. Experimentally, 500 mg. intravenously, every 24 hours, for a calf under 500 lb. was tried. This dose was found to be effective and became our standard dosage level. For animals over 500 lb., 1 gm. administered intravenously at 24-hour intervals was accepted. It was realized that more frequent administration would be advantageous, but the 24-hour schedule proved most practical.

Terramycin was used on eight cases of hemorrhagic septicemia and pneumonia after treatment with penicillin and sulfonamides, and on about 116 cases of these diseases as soon as symptoms were observed, and before any other antibiotic treatment had been given.

Case Reports

Following are several histories which are representative of the average cases treated.

Case 1. Hemorrhagic septicemia complicated with pneumonia: A 400 lb. Hereford calf had been shipped in from the West one week earlier. Temperature was 104 F.; respiration was accelerated. The calf was weak and completely off feed. Diagnosis — complicated hemorrhagic septicemia and pneumonia.

This animal had been treated with 3,000,000 units of procaine penicillin and 50 gm. sulfamethazine over a three-day period. No response was noted. Terramycin (500 mg.) was administered intravenously. Next day the temperature was 102.5 F. The calf appeared improved and was eating. Medication of the preceding day was repeated. On the third day of observation, all symptoms had disappeared. Rumen transfer was given to stimulate rumen

activity. No further treatment was given and uneventful recovery followed.

Case 2. Shipping fever complicated with pneumonia: This Hereford calf, weight 500 lb., had been shipped from the West ten days before developing symptoms. The temperature was 105 F.; respiration was visibly accelerated, and the symptoms were generally similar to those noted in case 1. This calf also had been treated with 3,000,000 units of procaine penicillin and 50 gm. of sulfathiazole over a two-day period without evident improvement. An intravenous injection of 500 mg. of terramycin was given on the first visit. No other medication advised. The next day the calf was greatly

Five-week-old Holstein calf exhibiting symptoms of marked depression, anorexia, and diarrhea. Temperature was recorded as 106 F. Had been "off feed" for two days. Respiration accelerated. Diagnosis—complicated pneumonia. After the second intravenous injection of 250 mg. terramycin, this animal's appetite returned and all symptoms were relieved by the third day.

improved and eating some; the temperature was 102.5 F. As a precautionary measure, the same dose of antibiotic was administered intravenously. Two days later the calf was checked and found perfectly normal in every respect.

Cases 3, 4, and 5. Shipping fever: These were Hereford calves weighing 300-500 lb., recently received by rail from western range country. All had temperatures above 105.5 F. and exhibited symptoms of inappetence and severe weakness in the hind legs. Terramycin (500 mg.) was administered intravenously to each. The next day all were eating; temperatures around 103 F. Treatment was repeated once and was followed by complete recoveries by the third day.

Case 6. Pneumonia: This cow was one of seven that were sick. There had been an accident in which the truck carrying a load of cattle had upset and the animals had been driven all night in the rain. Three days later, five cows had developed pneumonia. All were Hereford stock cows, three to eight years of age.

The temperature of the animal examined was recorded as 105 F.; respiration was fast, with a pronounced expiratory grunt. One gram of terramycin was given intravenously. The following day temperature was 103 F.; respiration was slower, and no grunting was noticed. The cow had eaten some hay and appeared in a much improved general condition. However, it was thought advisable to repeat treatment and the same dosage previously given was injected intravenously. This same treatment had been given all five cows which, by the third day, were all relatively normal. Stimulants were given and rumen transfers made. All responded favorably.

Cases 7, 8, and 9. Canine distemper: These were Collie pups; all from the same litter, but belonging to different owners. Each showed the following symptoms; temperatures 103.5 F. to 105 F.; respiration was accelerated. Animals were vomiting and diarrhea was present. Pups were depressed, thin, weak, and dehydrated. Ocular and nasal discharges were present. They had been off feed for two days. The treatment for each was the same; one 250 mg. capsule of terramycin *per os,* and five left with owner, with instructions to give one capsule twice daily, for a total daily dose of 500 mg. for three days. At this time pups were eating well and had improved in condition and pep. All subsequently recovered.

Case 10. Primary pneumonia: A Collie dog, two years of age, was presented for examination. The animal had been housed under rather bad conditions during very severe weather. Temperature was 104.8 F.; respiration was labored and fast. Dog was quite depressed; there was complete loss of appetite. Copious nasal discharge was noted; the animal was dehydrated. Diagnosis — primary pneumonia due to exposure. This patient was treated as were the previously described distemper cases, at the end of which time there was complete recovery.

Case 11. Baby pig disease: This is the case of baby pig disease previously mentioned. Six litters of week-old baby pigs were involved in the outbreak. All were sick, dehydrated, exhibited an abnormal desire for water, and had yellow, watery diarrhea. Temperatures ranged from subnormal to 105 F. and upward. Two sows exhibited symptoms. All sows were on good rations and farm conditions were noted to be better than average.

Pigs in the first three litters were each given one 250 mg. capsule of terramycin twice daily. They died rapidly. The other three litters were

given 50 mg. solution (prepared by diluting one 250 mg. capsule in water) twice a day but, again, no results were noted, and all the pigs died. The sows, however, recovered, as is usually the case in this disease.

Cases 12, 13, 14, and 15. Tonsillitis: These were four dogs of mixed breeding and ownership and all had sore throats with associated pronounced coughing. Some had a history of vomiting. All had enlarged tonsils and hyperemia of related areas of the throat. These were treated in the same manner as the distemper cases, and all recovered promptly. This condition is fairly common during early spring and is rather difficult to control and cure.

Cases 16 and 17. Acute staphylococcic mastitis: These were mature dairy cows of mixed breeding and in production. Temperatures were 105 F. and higher. Respiration was accelerated, and there was complete anorexia. Cows were depressed and quite stiff in the hind legs. One quarter of the udder of each animal was hard, enlarged, hot, and when milked, produced only yellow serum and clots. A diagnosis was made of acute staphylococcic mastitis. Treatment consisted of administering 1 gm. of terramycin intravenously. The next day the temperatures were normal and the intravenous treatment was repeated. The third day the animals were completely normal, with the exception of the infected quarter which required a few days of intramammary infusions of furacin®.

Discussion

It may be concluded from the results here reported that terramycin has favorable promise as a suitable antibiotic treatment of many of the most common infectious diseases of animals which, up to this date, have responded favorably to therapeutic methods presently available to practitioners. Of 124 cases of shipping fever and pneumonia in cattle, one was lost, and eight of these survived after previous treatment with procaine penicillin and sulfamethazine or sulfathiazole had failed to effect prompt recovery. In no cases were any side effects or untoward reactions seen.

Summary

1. Terramycin appeared to be effective at a dosage level of 1 mg. per pound body weight per day in cases of shipping fever and pneumonia, when administered intravenously to cattle.

2. In cases of acute staphylococcic mastitis, this antibiotic has been effective in controlling the toxemia, but it takes a few days of intramammary injections to clear the quarter entirely of infection.

3. Cases of canine distemper and pneumonia and other infections of the upper respiratory tract in dogs responded quite well to terramycin therapy.

4. In so-called "baby pig disease" terramycin was not effective.

5. Though four cases of navel septicemia did not respond to terramycin therapy, we believe that this antibiotic should be thoroughly investigated in this condition of calves.

®Eaton Laboratories, Inc., Norwich, N. Y.

Acknowledgment

The authors are indebted to Dr. Gerald R. Donner of Chas. Pfizer & Co., Inc., for generously supplying the material used in these studies.

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3. Morse, E. V., Spencer, G. R., and Simon, J., *In vitro* Sensitivity of a Number of Bacteria Isolated from Animals, to Terramycin. *Vet. Med.*, 45:405 (Oct.), 1950.

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Isolation of the chronic respiratory virus of birds is reported by Dr. H. L. Chute, in *Maine Veterinarian*, April 1951.

Symptoms produced by this relatively new virus are characterized as chronic. Mortality is low, but production in affected flocks is severely impaired. This virus is similar to that causing infectious sinusitis in turkeys. Penicillin treated suspensions injected into sinuses of normal turkeys produce a sinusitis in 14 to 28 days.

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Now listing 3,381 hostelries in the United States where dog owners can obtain accommodations for themselves and their dogs, the pamphlet Touring with Towser may be had by sending a request and 10 cents (to cover postage) to Gaines Dog Research Center, 250 Park Ave., New York 17, N. Y.

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Erratum

A typographical error occurred in the report titled Tuberculin Testing of Cattle in Britain and Denmark, that appeared on page XXV, in the April 1951 issue. The first sentence of the second paragraph should read:

An increase of 2 mm. or less to either tuberculin is taken as negative; 4 mm. or more as positive reaction, and 3 mm. as doubtful.

Assay Of Aureomycin In Milk By Use Of Methylene Blue*

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St. Paul, Minnesota

IN studies on the fate of aureomycin infused into the bovine mammary gland, a problem was encountered in the assay method of McCulloch, *et al.*,[2] for the antibiotic in milk. Clearing the milk of casein by the addition of acid not only entailed extra work but also gave evidence that varying quantities of aureomycin were removed in the precipitate to make for inaccuracies in this assay method. Since this method for aureomycin assay demands a transparent solution of the substance to be tested so that turbidity produced by the developing bacteria can be detected, clearing the milk by other methods, or developing a method by which the assay can be made on the unaltered milk are two obvious alternatives.

Since methylene blue may be reduced by bacteria, the rate of reduction of this dye in unaltered milk is suggested as a measure of the degree of inhibition by the antibiotic. Clearing the milk by the use of rennet instead of by acid precipitation of the calcium caseinate is also suggested as a possible procedure.

Methods

An assay method based on methylene blue reduction was developed. A description of this method as it was applied to milk is as follows:

One-half ml. of the sample was placed in each of two Wassermann tubes. The contents of one tube were serially diluted twofold in sterile methylene blue milk through four or more additional tubes. To each of these tubes, 1.5 ml. of a standard suspension of a test organism was added. The standard suspension consisted of a 1:200 dilution of an 18-hour broth culture of an organism designated by Dornbush[1] as Bacillus no. 5. This organism was indicated by Dornbush as resembling *Bacillus cereus* var. *mycoides*. The dilution of the broth cultures, as well as the serial dilution of samples, was made with sterile milk containing 10 ml. of a methylene blue solution per 100 ml. of milk. The methylene blue solution was prepared as prescribed in Standard Methods for the Examination of Dairy Products[3]. Following the addition of the standard suspension, the tubes were stoppered with sterile rubber stoppers and were incubated in a water bath at 37 C. for four hours. After incubation, the tubes were removed from the bath and read. The end point or titer was the greatest dilution which resulted in no reduction of methylene blue. The concentration of aureomycin in the milk samples was obtained by reference to the lowest inhibiting concentration of this antibiotic for the test organism as obtained by dilution of a standard sample containing a known amount of aureomycin. This reference concentration was determined concurrently with the analyses of routine samples.

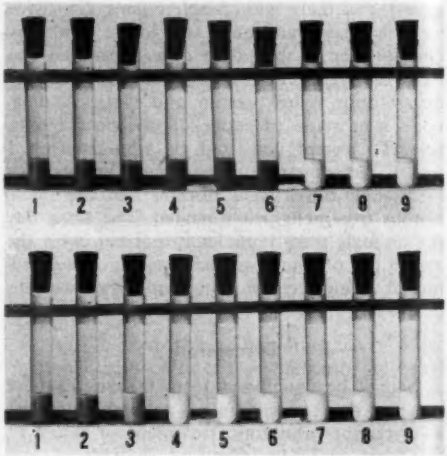

Fig. 1. Typical results of methylene blue milk assay. Above: Sample containing 5 micrograms aureomycin per ml. Below: Sample employed in determining the inhibiting concentration of aureomycin for the test organism. See table 1.

The standard sample containing a known amount of aureomycin was prepared as follows: An aqueous stock solution containing a

*Scientific Journal Series Paper No. 2620, Minnesota Agricultural Experiment Station.

Aureomycin supplied by Lederle Laboratories, Division, American Cyanamid Company, Pearl River, N. Y.

**Division of Dairy Husbandry, University of Minnesota, University Farm, St. Paul.

concentration of 1 mg. of aureomycin per ml. was prepared. Sufficient stock solution was added to sterile milk to yield a concentration of 0.5 microgram per ml. of milk. This constituted the standard sample and 0.5 ml. was used in the assay procedure.

For comparison purposes, samples were assayed according to the method of McCulloch, *et al*[2]. When the McCulloch method was used, the end point was that dilution showing complete inhibition of the test organism as detected by gross observation.

Control tubes included in assays by the method of McCulloch consisted of two tubes, one containing sterile penicillin assay broth, and the second containing sterile penicillin assay broth plus the test organism. Similarly two control tubes, one containing sterile methylene blue milk, and the second containing sterile methylene blue milk plus the test organism, were included in assays using the methylene blue method. All readings were disregarded if any of the following observations were made in the control tubes:

1. Turbidity present in the sterile penicillin assay broth.
2. No turbidity in the penicillin assay broth plus test organism.
3. Reduction in the sterile methylene blue milk.
4. No reduction in the sterile methylene blue milk plus test organism.

Aureomycin assays by both the methylene blue and the McCulloch procedures were applied to blood serum and urine to which a known amount of aureomycin had been added, as well as to these products obtained from treated cows. The assay procedures were as described above.

Experimental Results

Assays were run on milk samples to which known amounts of aureomycin in aqueous solution were added. The results of typical analyses are shown in table I. It may be observed that the end point or the inhibiting concentration for the test organism by the methylene blue method, as determined by dilution of the standard sample, represented a concentration of 0.031 microgram per ml. The end point for sample no. 1 (previously adjusted to a concentration of 5 micrograms aureomycin per ml.) was at a dilution of 1:128. Since 0.031 microgram per ml. constituted the inhibiting concentration, the assay of sample no. 1 resulted in a recovery of this antibiotic to the extent of 3.968 micrograms per ml. (128 x 0.031). This represents a loss in recovery of approximately 1.1 microgram per ml. The accuracy of the method is dependent upon the dilution factor used. If desired, the accuracy may be increased by using a smaller dilution factor. The data in table I pertaining to the methylene blue method illustrate a consistency in the results of the assays for aureomycin on milk samples containing a concentration to at least 40 micrograms per ml.

One of the difficulties encountered through use of the McCulloch method was in determining the end point. This is indicated in the data for sample no. 1 which is presented in table I. If all milk solids are not removed

TABLE I. COMPARISON BETWEEN THE METHYLENE BLUE AND McCULLOCH METHODS OF ASSAY

Tube	Determination of inhibiting concentration of aureomycin for the test organism			Milk samples containing known quantities of aureomycin(1)								
	Quantity of aureomycin	MBM(2)	M(3)	Final dilution	Sample No. 1 (5.0 mcg./ml.)		Sample No. 2 (10.0 mcg./ml.)		Sample No. 3 (20.0 mcg./ml.)		Sample No. 4 (40.0 mcg./ml.)	
					MBM	M	MBM	M	MBM	M	MBM	M
	(mcg./ml.)											
1	0.125	-	-	1-4	-	-	-	-	-	-	-	-
2	0.062	-	-	1-8	-	-	-	-	-	-	-	-
3	0.031	-	-	1-16	-	-	-	-	-	-	-	-
4	0.016	R(4)	-	1-32	-	-	-	-	-	-	-	-
5	0.008	R	-	1-64	-	-	-	-	-	-	-	-
6	0.004	R	2+(5)	1-128	-	-	-	-	-	-	-	-
7	0.002	R	4+	1-256	R	-	-	-	-	-	-	-
8	0.001	R	4+	1-512	R	±	R	-	-	-	-	-
9				1-1,024	R	2+	R	-	R	-	-	-
10				1-2,048	R	4+	R	2+	R	-	R	-
11				1-4,096	R	4+	R	4+	R	2+	R	-
12				1-8,192	R	4+	R	4+	R	4+	R	2+
13				1-16,384	R	4+	R	4+	R	4+	R	4+

Legend: (1) Aureomycin in aqueous solution
(2) MBM = Methylene blue milk assay method
(3) M = McCulloch assay method
(4) R = Reduction of methylene blue
(5) + = Degree of turbidity
mcg. = Microgram

in preparing the sample for analysis, a turbidity remains which makes it difficult to determine whether or not growth of the test organism had occurred. Even in the case of well prepared samples, the presence or absence of growth in the tubes containing the higher dilutions of the sample is often difficult to determine by gross observation. In this respect the end point as determined by the methylene blue method is distinct and therefore advantageous. Furthermore, the McCulloch method involves a time-consuming treatment of the milk sample by reason of the necessity for protein precipitation. This is eliminated by use of the methylene blue method of assay.

Since aureomycin may be administered in ointment preparation, assays were run on samples of milk to which it was added as an ointment preparation. A comparison between the use of rennet and of 7N H_2SO_4 as a precipitating agent was included, as well as an assay of the precipitate after treatment of the milk with H_2SO_4. The results are shown in table II. It may be observed that considerably higher values were obtained by the methylene blue method. The use of rennet as a precipitating agent resulted in lower values than when sulfuric acid was used. The assay on the rediluted acid precipitate gave values which indicated that quantities of aureomycin were trapped in the precipitate and therefore unavailable for assay by the McCulloch method.

Data which are not included in this report showed that the methylene blue method was adaptable for use in the assay of blood serum. The method was not satisfactory in the assay of urine.

Conclusions

The methylene blue method of assay for aureomycin in milk is simple and may be rapidly performed. The method compares favorably with the McCulloch method in accuracy. In addition, no time-consuming preliminary treatment of the sample is necessary. The end point which establishes the basis for interpreting the assay is easily determined. The method is adaptable to the assay of aureomycin in milk from animals which have been treated with aureomycin in ointment preparation as well as in aqueous form. The McCulloch method when used in assays of such milk results in low values due to an entrapment of the active agent in the precipitate formed during the preliminary treatment of the sample. The use of rennet as a precipitating or coagulating agent in the McCulloch method resulted in low values.

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TABLE II. EFFECT OF VARIOUS METHODS OF CASEIN PRECIPITATION ON RESULTS BY THE McCULLOCH METHOD OF ASSAY FOR AUREOMICIN IN MILK CONTAINING AUREOMICIN (1) IN OINTMENT PREPARATION

Tube	Determination of inhibiting concentration of aureomycin for the test organism: Final dilution	Quantity of aureomycin	MBM(2)	M(3)	McCulloch Method of Assay: Method of precipitation: Rennet	7N H_2SO_4	Rediluted acid precipitate(4)	MBM of Assay
		(mcg./ml.)						
3	1-16	0.031	-	-	-	-	-	-
4	1-32	0.016	R(5)	-	-	-	-	-
5	1-64	0.008	R	2+(6)	-	-	±	-
6	1-128	0.004	R	4+	2+	-	2+	-
7	1-256	0.002	R	4+	4+	4+	4+	R
8	1-512	0.001	R	4+	4+	4+	4+	R

Legend:
(1) Milk sample contained 5.0 micrograms aureomycin per ml.
(2) MBM = Methylene blue milk assay method
(3) M = McCulloch assay method
(4) Precipitate rediluted to original volume of milk sample
(5) R = Reduction of methylene blue
(6) + = Degree of turbidity
mcg. = Microgram

Treating Rabies-Exposed Animals

GLEN L. DUNLAP, D.V.M., M.S., and ASHE LOCKHART, B.S., D.V.M., Kansas City, Missouri

Recent observations of rabies in wild life of the Midwest again emphasize these reservoirs of infection.

An Iowa practitioner reported strange actions of three skunks around farm buildings in broad daylight. The skunk, a nocturnal prowler, would venture near human habitation only under compelling nervous stimulation to alter natural instincts. These and other small animals are reported frequently to attack cattle. Any species of wild life should be suspected of rabies when bold actions not common to healthy individuals are observed. In addition to skunks, squirrels, foxes, badgers, raccoons, even woodchucks (ground hogs), and others may disseminate rabies to farm animals.

Vaccination of livestock after exposure has never been well standardized. The recommendations made by these authors are carefully evaluated by studious field and laboratory observations.—Editor.

Prompt local treatment of fight wounds in exposed animals should be encouraged and the necessity for such treatment widely publicized. Local treatment should be given immediately after an animal is bitten; within the hour if possible, because after two hours the chances of successful cleansing of the wound are greatly reduced.

The wounds of animals presented shortly after being bitten should be thoroughly cleansed and flushed with soap and warm water. A 20% solution of green soap is very effective. Delayed treatment (after two hours) should also include the use of fuming nitric acid. This is applied to all surfaces and margins of the wound with a glass rod or wooden applicator. Following the use of nitric acid, the wound should be treated with a solution of sodium bicarbonate.

The use of rabies vaccine is a practical and efficient means for preventing the development of rabies in all exposed animals. It is essential that treatment be begun at the earliest possible time and that the initial dose of vaccine be large. Experiences of observing veterinarians indicate the advantage of giving large initial doses of vaccine to exposed animals. For a 40-lb. dog, 20 cc. of vaccine as the initial dose should be followed at 24- to 48-hour intervals by two 10 cc. doses. For a horse or cow weighing 1,000 lb. or more, 100 cc. should be the initial dose, followed by two 50 cc. doses at 24- to 48-hour intervals. In sheep and swine, the initial dose is from 10 cc. to 50 cc., depending upon the size of the animal, and this is to be followed by two doses, half as large as the initial dose, at 24- to 48-hour intervals.

The logic for this procedure is that it has been definitely shown that immunity following the administration of anti-rabies treatment is rapid; seven to ten days. Early administration of a large initial dose of vaccine results in quick maximum immunity.

Owners always should be warned that occasional failures will follow treatment and consequently treated animals should be observed frequently and quarantined for at least 60 days.

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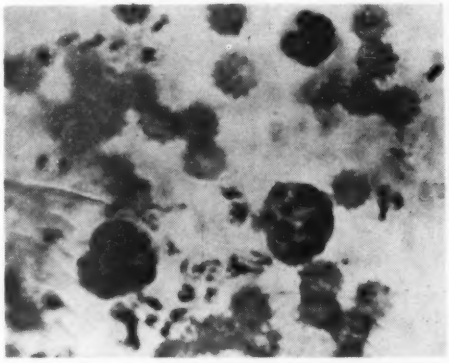
Blood Cellular Changes Due to Anticoagulant

WILLIAM F. JACKSON, D.V.M., M.S.,
Athens, Georgia

The cells shown in the smear (see photo below) were first observed in the blood from a three-month-old Jersey calf with clinical symptoms of virus pneumonia. The blood sample was taken late one afternoon and stored in the ice box overnight and the smear was



made the following day. The smear was stained by standard procedure with Wright's stain. Several cells were found that appeared to have a sky blue cytoplasm with very faint granulation. There were numerous round bodies, varying in diameter and number, distributed unevenly throughout the cytoplasm of these cells that stained a deep purplish red.

A few weeks later a Beagle was presented to the clinic one night with clinical symptoms of distemper. Blood sample was taken and the hemogram completed the following morning. There were several cells in the smear similar to the ones described above. These slides were presented to the local medical pathologist and no definite conclusion was reached. The possibility of their being associated with viral in-

(*Continued on page* 232)

The Blood And Plasma Bank†

E. A. MAJILTON,* D.V.M., and L. L. KELLEY,** D.V.M.

THERE is a growing interest among clinicians operating veterinary hospitals, in the subject of blood and plasma banks, stimulated by recent transfusion experience in human medicine. These have proved of inestimable value in routine emergency use, and have a wide range of therapeutic value in treating many systemic infections and various diseases. The information contained in this article is designed to assist the veterinarian in establishing and maintaining a blood or plasma bank. Containers and equipment used in the collection and storage of blood in this work were designed by Abbott Laboratories, North Chicago, Ill. Features of simplicity, practicality and inexpensiveness, make this apparatus especially adaptable for veterinary usage.

Collection of the Blood, and Equipment Used

A large, quiet dog is the best donor. In such, no anesthesia is necessary. It may be necessary to use a sedative or an anesthetic to collect the blood from some donors. If such is the case, pentothal sodium® or nembutal® may be used. Wait for five to six minutes following the administration of the anesthetic used, in order to allow it to pass from the blood stream, before proceeding. For mild sedation, nembutal suppositories may be used. During the waiting period the jugular furrow is shaved, cleansed, and a skin antiseptic applied.

Blood is collected with the aid of the donopak,® a sterile, pyrogen-free, disposable, plastic blood collection unit. This, closed technic, 250 cc. size, contains A-C-D solution,® a well known and widely used anticoagulant and blood preservative. For the collection of blood from large animals, 500 cc. containers are recommended. The use of this equipment avoids bacterial contamination, thus protects and assures the keeping qualities of blood drawn. It affords a practical, simple, efficient and inexpensive method of collection for storage or for immediate use. In emergency cases, it has been possible to collect blood without assistance.

Method of Collection

(*See fig.* 1 *and diag.* 1, *opposite page*)

1. The protective cap is removed from the donopak adapter and a 15-gauge needle is attached. The needle is inserted through the rubber stopper of the collection container (A-C-D bottle).

2. Container is inverted to moisten tubing, without removing air filter on end of tubing.

3. A second 15-gauge needle is inserted through rubber stopper of A-C-D container, as an air vent.

4. Air filter at end of tubing is removed and a 15-gauge needle is attached to this adapter for venipuncture.

5. A-C-D container is lowered below level of donor, and venipuncture is made. Donor blood is collected by gravity, not vacuum.

6. When sufficient amount of blood has been collected (240 cc. into the 250 cc. size container or 480 cc. into the 500 cc. size container), the pinch clamp on the tubing is closed, the needles are withdrawn from donor and collection container. Needles are removed from donopak and donor tubing discarded.

Selecting the Donor

Euthanasia cases may be used, if these animals are in a normal, healthy condition. Blood donors are maintained in our clinics making accessible healthy donors as required. For such purpose, a well trained, quiet Greyhound has been found to be most satisfactory. Vitamin B complex solutions, liver preparations, amino acid solutions and hematopoietic agents are used to keep these dogs fit for blood donation. It is believed that a donor dog should be at least two years of age, and a horse or a cow one year of age or older. A normal, healthy dog weighing from 40 to 75 lb. is usually

†This article evolved as a result of the blood transfusion demonstration presented as part of the South Florida Veterinary Medical Association Small Animal Program during the A.V.M.A. Convention at Miami Beach, Aug. 21-24, 1950.

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®Abbott Laboratories, North Chicago, Ill.

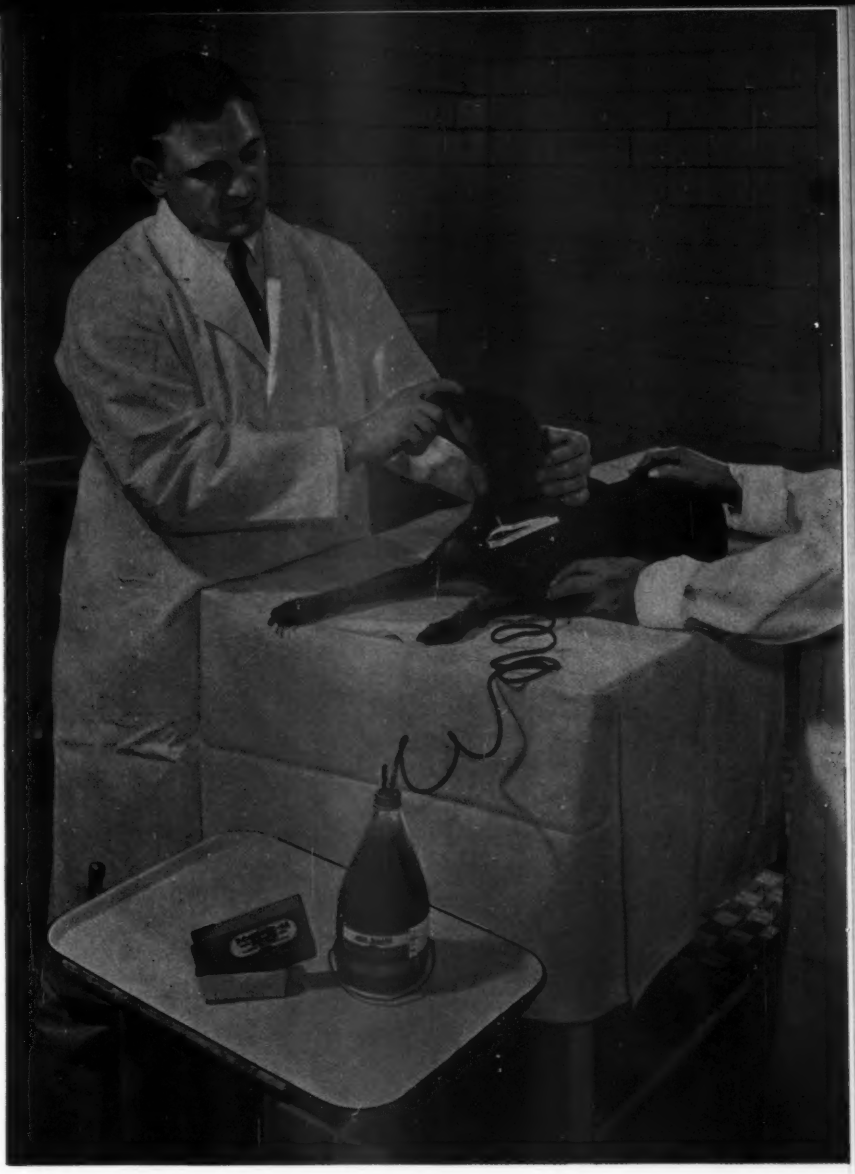
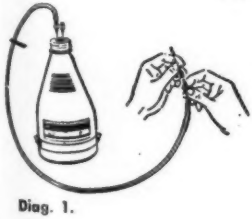
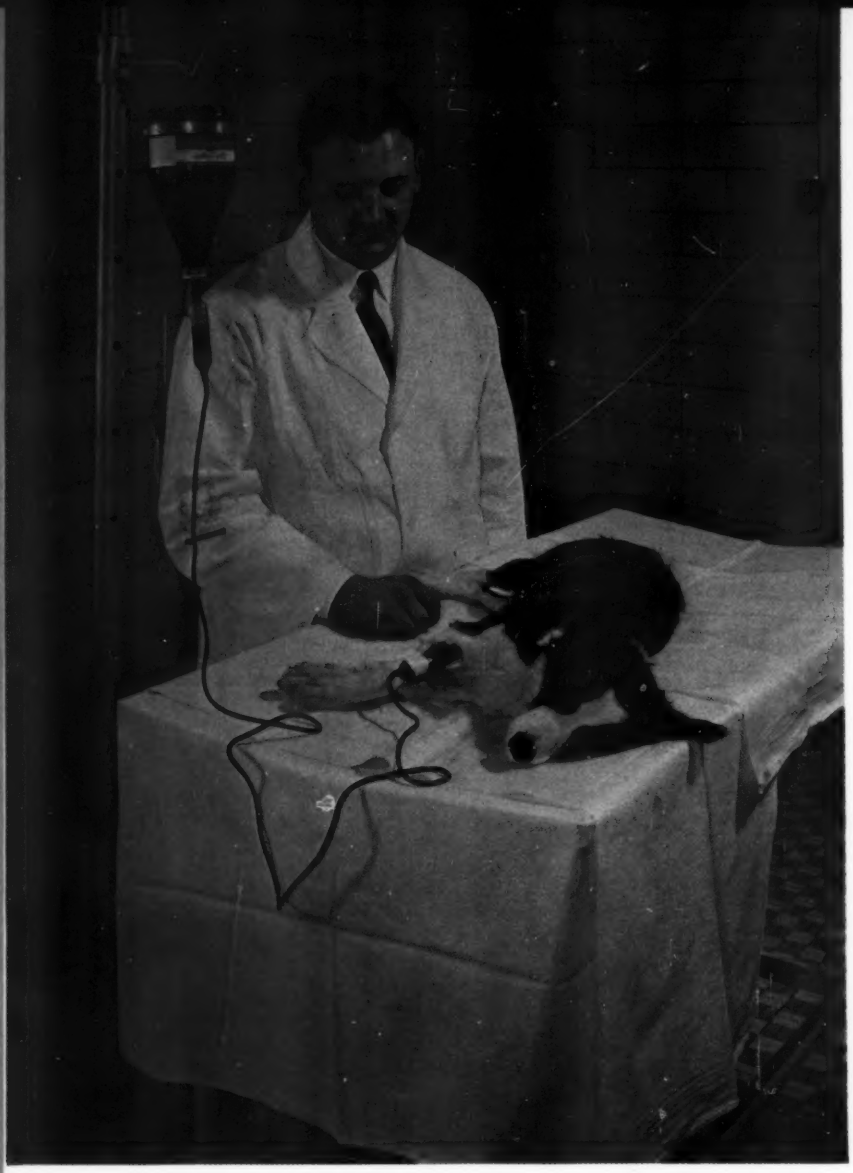


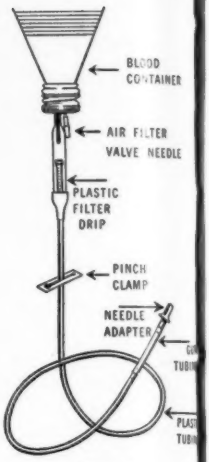
Fig. 1.



Diag. 1.

Illustrated is a convenient method for blood collection, making use of a special apparatus designed for this purpose, known as donopak-48. A large, quiet dog is preferable as a blood donor; however, any healthy animal may serve. When advisable to do so, light anesthesia may be induced by the intravenous technic. The sterile container and tubing are ready for use as packaged. Bottle containing anticoagulant and blood preservative is lowered and blood is collected by gravity. To stop collection, pinch clamp on tubing is closed, needles withdrawn from donor and collection container. Tubing will contain sufficient blood for any serological determinations desired.





Diag. 2.

Fig. 2.

Indirect blood transfusion via cephalic vein, making use of apparatus known as the RC-pak. The blood container may be the actual collection vessel, bail attached, (see fig. 1) or a plug-in type container. Equipment for transfusion is packaged ready for use without additional sterilization (see diag. 2). Whole blood may be stored at 42 to 44 F. for 15 to 18 days, after which time, the clear, supernatant plasma may be collected in a separate bottle and transfused as illustrated above for the blood.

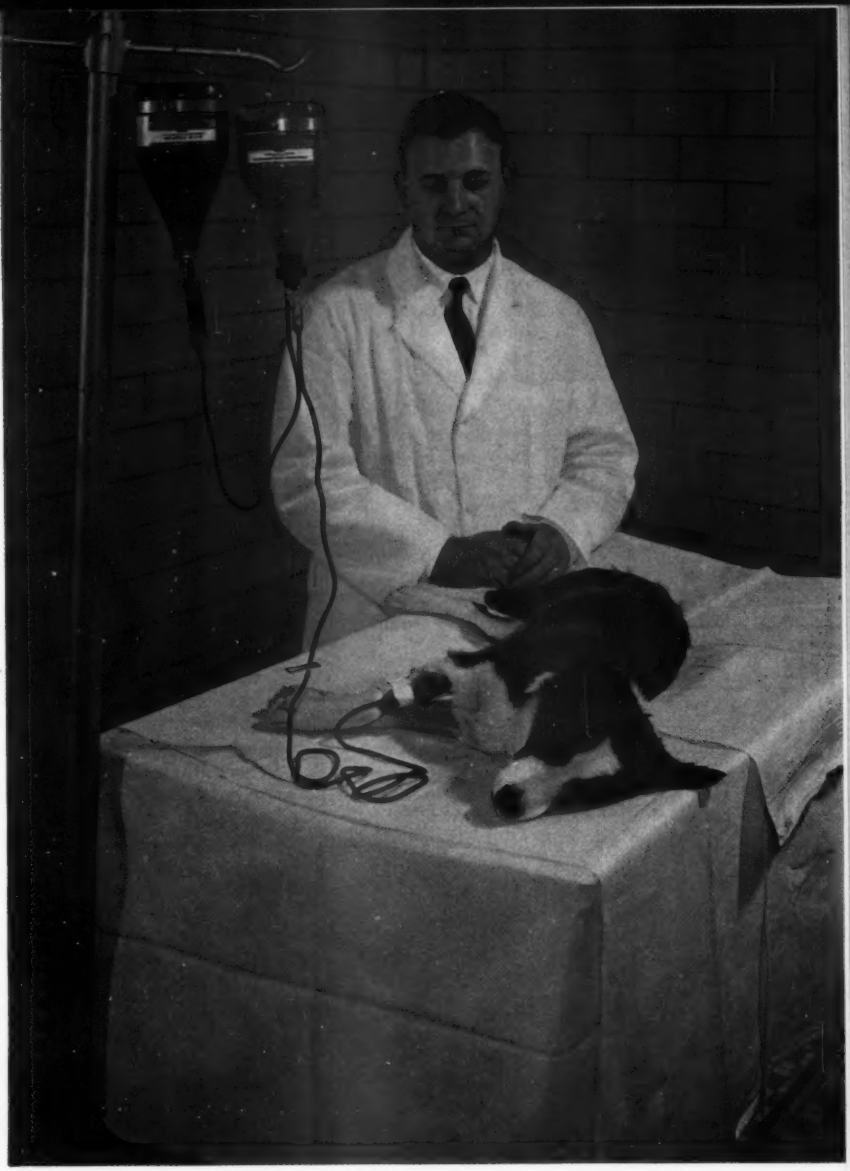
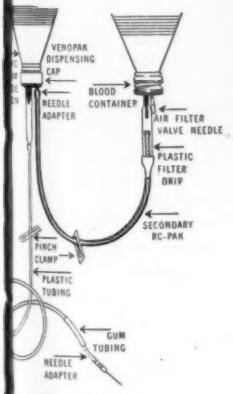


Fig. 3.



Diag. 3.

By employment of the apparatus illustrated above, physiological saline may be administered with whole blood or plasma. The apparatus is referred to as the venopak and secondary RC-pak in series hook-up. This unit offers advantages when it is desired to administer larger quantities of fluid and blood to severely dehydrated patients or those in extreme shock. Also especially adaptable for indirect transfusion in large animals. The blood container empties first and may be replaced with another without stopping flow to patient. Air in connecting tubing is absorbed in the primary container.

selected. An animal is rejected as a donor for the following reasons: (1) if suffering from a febrile condition; (2) history of recent respiratory infection or other acute illness; (3) if suffering from serious chronic or transmissible disease; (4) history of jaundice during past six months; (5) poor physical state; (6) hemoglobin below 10 to 12.5 gm. (in dog, cow and horse).

It is best to withhold food from donor for six hours prior to collection.

Storage of Blood

Banked blood should be stored in a refrigerator at a constant temperature of 42 to 44 F. Blood so collected will remain stable for a period of 15 to 18 days. After 18 days, the stored blood may be converted to plasma by aspirating the clear supernatant plasma from the sedimented blood cells. This technic will be described in detail later.

Large animal blood banks may be established by employing a technic similar to the one outlined above.

Transfusing Blood

Indirect blood transfusions are conveniently conducted by the use of RC-pak,® a sterile, pyrogen-free plastic disposable transfusion unit (see fig. 2 and diag. 2), or transfusions may be accomplished by giving whole blood in a series hook-up with physiological saline solution, employing the venopak® and secondary RC-pak® (see fig. 3 and diag. 3). The series hook-up offers the advantage of transfusing several bottles of blood without stopping the flow to the patient or removing the needle from the vein. The additional bottles of blood are added to the series hook-up as the containers are emptied.

The use of a 20 to 23-gauge transfusion needle is recommended for small animal use depending on the size of the animal and vein used, and 12 to 14-gauge for large animal transfusions.

Method of Administration

The stored bottle of blood is removed from the refrigerator. (*Do not warm.*) Cells that have settled may be resuspended by inverting the bottle several times.

RC-Pak Method

1. Protective cap is removed from blood container.

2. Using a sterile 18 or 19-gauge needle, the diaphragm or stopper is perforated six or eight times at indentation mark.

3. The sterile RC-pak unit is removed from the carton, the protective covering removed from the tip of the filter drip and this end inserted in the previously perforated indentation mark in stopper of the bottle.

4. Air filter valve is inserted through stopper of the bottle.

5. The pinch clamp is closed and the bottle is suspended, using the hang-up bail wire.

6. The plastic filter drip (diag. 2) is compressed between the index finger and the thumb to fill the drip to the desired level, and the pinch clamp is opened causing the air to be expelled.

7. The pinch clamp is closed, a transfusion needle is attached, venipuncture is made, and the rate of flow adjusted.

Venopak and Secondary RC-Pak Method

1. The venopak is removed from its sterile tray by grasping the needle adapter by its blue protective cover and uncoiling the tubing. Remove red protective covering from the venopak dispensing cap and thread cap on to the solution container. Close the pinch clamp on tubing by sliding the metallic strip into position. Invert and suspend container by the hang-up wire. Remove blue protective covering on needle adapter and attach sterile needle. Open pinch clamp, clearing the tube of air bubbles. The venipuncture is then made and the infusion of saline started at the desired rate of flow.

2. The secondary RC-pak is attached to the A-C-D blood container in the same manner that the RC-pak was attached, in diag. 2. The pinch clamp is then closed and the bottle of blood is suspended next to the container with the attached venopak, and the plastic filter drip is filled to the desired level, in the same manner as the RC-pak. The secondary RC-pak has a shorter tubing to facilitate the use of a series hook-up. The air filter tube is removed from the air valve of the venopak, and the sterile needle adapter of the secondary RC-pak is attached here. (See diag. 3.)The air in the connecting tubing of this secondary unit will be absorbed in the primary container. The secondary container (in this case, the blood container) empties first and an additional unit may be attached if needed.

The jugular vein may be used to transfuse blood in large animals and small animals, if desired. The recurrent tarsal (external saphenous) or tthe cephalic vein is also used in small animals.

Cross-Matching of Bloods

The cross-matching of animal bloods in the majority of cases is not considered necessary. At a rather large dog blood bank in operation at the Baylor University in Houston, cross-matching was done on several hundred animals, and as a result of this study it was reported that untoward reactions following transfusions were exceedingly rare and cross-matching was not considered to be essential. This has also been confirmed by many veterinarians on both large and small animals. However, should cross-matching be desired or deemed necessary, cross-match the serum of the donor with the red blood cells of the recipient, and the red blood cells of the donor with the serum of the recipient.

Indications for Blood Transfusions

The indications for blood transfusions are practically the same in veterinary medicine as they are in human medicine. The use of whole blood and blood derivatives has come to occupy an important place in the treatment of animal diseases.

Indications for the use of whole blood therapy may be summarized as follows:

1. Treatment of anemia especially where other therapy is ineffective.

2. As a preoperative or postoperative measure; in the treatment of acute and chronic hemorrhage or shock, whether blood is lost internally or externally.

3. As an adjunct to other forms of therapy for combating infections.

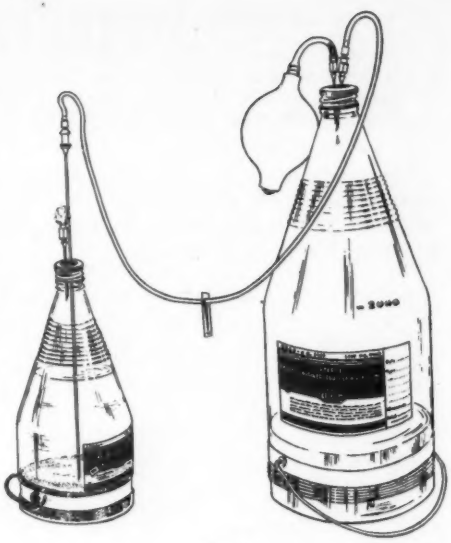
4. To aid in the control of bleeding due to various purpuric diseases.

5. Whole blood may be used in any and all conditions where it is necessary to increase the number of circulating cells.

Blood is of tremendous nutritive value and is of great importance in treating any severe pathological condition, be it surgical or medical. Distemper immune bodies contained in adult canine blood provide an excellent therapeutic aid in treating distemper, and serve a prophylactic purpose for hospitalized patients.

The dosage of blood is calculated on the basis of the following: It is usually necessary to bring the patient's blood volume and hemoglobin up to within 75% of the total volume. The average dose required to accomplish this is from 5 to 10 cc. of blood per lb. of body weight.

Another method of calculating the volume of blood to be transfused is as follows:



Diag. 4.

Example:

Donor:	16 gm. hemoglobin—100%
Recipient:	4 gm. hemoglobin— 25%

Phillips and Van Slyke copper sulfate method is used for determining hemoglobin.

Since there is approximately 40 cc. of blood per lb. of body weight in a normal animal, there would be 400 cc. in a 10 lb. dog, the recipient. Therefore, to raise the hemoglobin level to 75% in this particular dog, 200 cc. of blood would be needed.

or

400 cc. blood = the total blood volume for a 10 lb. dog.

$400 \div 100 = 4$ cc. of blood needed to raise hemoglobin of recipient 1%.

$4 \text{ cc.} \times 50 = 200$ cc. to raise hemoglobin from 25% to 75% in 10 lb. dog.

Plasma Production

If whole preserved blood is permitted to stand in the refrigerator for a period of 48 to 72 hours, the red cells will settle, forming a well defined mass in the lower section of the bottle, leaving the clear, honey-colored fluid portion on top. This clear fluid is the plasma portion of the blood and can be aspirated from the bottle and stored for a period up to two years. A 250 cc. bottle of whole blood will yield approximately 115 cc. of plasma.

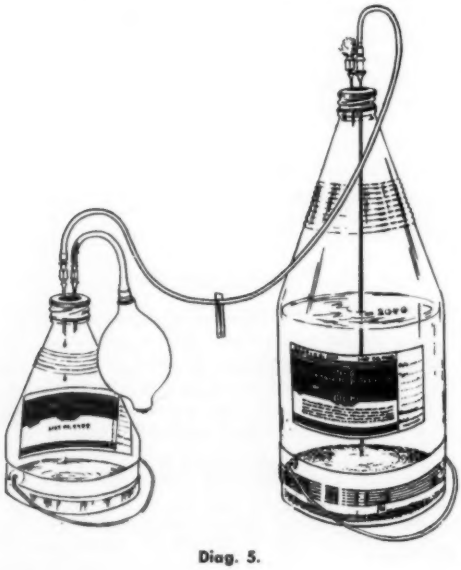
Technic of Plasma Collection

It is most important that the operator follow a sterile technic throughout the collection of plasma, as in the collection of blood, because this will protect the keeping qualities of both and safeguard the patient.

The operator can remove the safety seal from the 2,000 cc. sterile plasma collection bottle, as seen in diag. 4 and 5. A nine-inch aspirating needle is inserted into the 250 cc. bottle of stored blood, down to the layer of separation. The plasma is drawn from this bottle into a 2,000 cc. size collection container. The process, as seen in diag. 4, is repeated until the 2,000 cc. collection bottle is filled. The plasma is refrigerated and allowed to settle for seven to 14 days or until the supernatant liquid is clear. Then the same process is used and the clear plasma is aspirated from the 2,000 cc. collection bottle into 250 cc. plasma storage bottles. This plasma may then be kept for periods up to two years. Refrigerated storage at 42 to 44 F. is recommended, or it may be frozen.

Uses of Plasma

Blood constituents, and the antibodies contained in plasma as a result of active immunity to distemper and other canine diseases, are of tremendous value to small animal practitioners. Therefore, this plasma can be used to great advantage in the treatment of distemper cases and other systemic infections of dogs.



Diag. 5.

Likewise, large animal blood contains antibodies which may be helpful in treating various conditions of equal importance in large animal medicine.

Here is a readily accessible, inexpensive and effective therapeutic agent which will greatly aid the veterinary profession.

Advantages of a Blood Bank

A blood and plasma bank established where it is close at hand and available at all times affords an abundant supply of the best therapeutic aids for emergency use. In the methods of collection and transfusion outlined, little is wasted and surplus may be stored successfully for extended periods. Both agents are useful for best results in the treatment of a variety of disease conditions common to farm livestock and pet animals.

There are theoretical disadvantages to the use of stored blood in certain cases, and in these, freshly drawn blood rather than refrigerated blood may be used if deemed necessary. Aging and deterioration of erythrocytes, which occur with storage, is minimized by use of modern blood preservatives. Hemolysis occurs on storage of all blood, but is not significant if blood collection and preservative methods are carefully controlled. There are no important disadvantages in its use.

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Blood Cellular Changes

(*Continued from page* 225)

fection was considered, briefly, as some inclusion bodies have been found in circulating lymphocytes. The slides were then sent to Dr. David L. Coffin. They were returned with the suggestion that they were neutrophils and had disintegrated on over-exposure to oxalate. Normal blood was taken and smeared immediately; the remainder was exposed to the standard oxalate mixture overnight. The leukocytes were concentrated by centrifugation and the buffy layer was stained with Wright's stain. It was necessary to cut the staining time down to get a comparable stain. In this smear there were numerous cells as described above, whereas the smear taken from fresh blood did not show any of the cells. Fresh blood was centrifuged and a smear was made from the buffy layer. All the leukocytes were found to be normal. Recently, such cells were found in a student's blood that had been oxalated for three hours.

Apparently these changes are due to the anticoagulant. Therefore, it is recommended that smears be made immediately after the blood is drawn and if possible before it has been added to the anticoagulant.

EDITORIAL COMMENTS

BAI Inspection Activities

The government fiscal year 1950, which ended June 30, 1950, makes the 44th year of continuous meat inspection service under the provisions of the Meat Inspection Act approved June 30, 1906. At that time federal inspection was maintained in 163 establishments located in 58 cities. Evidence of the growth of the service is contained in a summary of activities prepared by the Meat Inspection Service, in which it is stated that veterinary inspection is now conducted at 987 establishments located in 385 cities and towns.

Personnel of the Meat Inspection Service engage in (1) the examination of food animals, including cattle, calves, sheep, swine, goats, and horses prior to slaughter to eliminate those animals found to be affected with disease; (2) postmortem examination of each carcass at time of slaughter to detect and eliminate diseased or otherwise unfit meat; (3) destruction for food purposes of all diseased, unsound, or otherwise unwholesome meat and meat by-products; (4) supervision of the preparation of meat and meat food products to assure their cleanliness and wholesomeness during their preparation; (5) guarding against the use of harmful preservatives and other deleterious ingredients; (6) supervision of the application of marks to meat and meat food products to show that they are "U.S. Inspected and Passed;" (7) informative labeling and prevention of the use of false and deceptive labeling on meat and meat food products; (8) certification of meat and meat food products for export; (9) inspection of meat and meat food products offered for importation into this country; (10) examination of meat and meat food products for compliance with specification requirements of governmental purchasing agents; and (11) such investigations as are necessary to insure the accuracy and effectiveness that inspection produces.

During the fiscal year reported, 87,732,534 animals were inspected, of which, 6,820 were condemned on antemortem and 295,221 on postmortem inspection. A total of 87,428,617 head were finally passed for food.

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A survey conducted by the Committee on General Surgery of the American Animal Hospital Association indicates that surgery accounts for an average of 24.65% of the gross income of member hospitals.

Salmon Poisoning a Rickettsial Disease

Rickettsia, transmitted by trematodes, has been shown by Cordy and Gorham (*Am. Jour. Path.*, 26:617, 1950) to be the causative agent of salmon "poisoning" in dogs, foxes and coyotes.

The disease has been recognized for many years in the Pacific Northwest. Incidence of the disease in carnivore has been limited by the range of a specific snail of the area of occurrence. Evidence has been presented by workers that a small intestinal fluke, *Troglotrema salmincola*, was a natural vector. Encysted metacercariae in salmon, trout, steelhead, or other members of the family Salmonidae are regarded as the means of infecting dogs. Ova passed by adult flukes in the dog's intestine develop mirocidia which infect a small snail, *Goniobasis plicifera* var. *silicula*. Cercariae escape from the snail and infect suitable species of fish, where they become encysted in the muscle tissue or organs of the fish to complete the life cycle of the fluke.

Symptoms

Symptoms previously described have been produced experimentally by feeding fish to both dogs and foxes. Lesions found in experimental animals reported by these authors are not in complete agreement with other workers. They report that the principal gross and microscopic lesions in the dogs and foxes experimentally infected include hyperplasia of visceral and somatic lymph nodes, sometimes with hemorrhage or necrosis; variable hyperplasia of the spleen and thymus, and hemorrhage in the gastrointestinal tract and lung.

Etiology

In all animals used in this experimental work—four foxes and two dogs infected by receiving fish containing large numbers of fluke cercariae and ten foxes and 11 dogs by intraperitoneal inoculation of suspensions of infected tissue—small elementary bodies were found in the cytoplasm of reticuloendothelial cells of lymph nodes, tonsils, spleen and intestinal lymph follicles. These bodies were characteristic of Rickettsia and their constant presence in infected animals and absence in normal animals suggests the etiology of salmon disease of carnivore.

Lifting of Import Restrictions on Mexican Cattle not Contemplated for 1951

Many months of rigid inspection to detect and eradicate any sporadic outbreaks of foot-and-mouth disease in Mexico will be required on the part of the Mexican-United States Commission for the Eradication of Foot-and-Mouth Disease before the international livestock sanitary officials can consider recommending to their respective governments the reopening of the Mexican-American border for the passage of animals.

That viewpoint was expressed recently by Dr. C. U. Duckworth, of Sacramento, Assistant California State Director of Agriculture, upon his return from Albuquerque, N. Mex., where he attended a meeting of the U. S. Secretary of Agriculture's Foot-and-Mouth Disease Advisory Committee.

The Committee meeting was called by its chairman to review the progress of the joint eradication program and to hear the final report of Gen. Harry H. Johnson, of Houston, Tex., who recently resigned as codirector of the Commission to return to private business. General Johnson has been succeeded by Dr. L. R. Noyes of the U. S. Department of Agriculture.

Expenditures of the United States in the campaign are now about $500,000. per month, whereas they once reached $2,450,630. per month at the high mark of the campaign to save the United States from the disease. Total employees of the Commission now number about 2,000; whereas the total once was 8,000.

The last outbreak of foot-and-mouth disease in Mexico was in a herd of 56 animals in the state of Vera Cruz, December 29, 1950.

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The Production and Marketing Administration of the USDA has announced proposed revisions in inspection and grading regulations for ready-to-cook domestic rabbits under which only those rabbits which have been officially inspected for condition and wholesomeness may be officially graded for quality. Present regulations, which also apply to ready-to-cook poultry, permit grading of ready-to-cook rabbits which have been inspected by non-official inspectors such as processing plant employees.

The proposed changes would establish separate regulations for ready-to-cook rabbits similar to those which have been proposed for ready-to-cook poultry.

California Veterinarians' Licenses Protected While Licensees are in Armed Forces

California veterinarians would have their licensed status protected while they are serving in the armed forces, by provision of Assembly Bill 71. The bill has already passed both houses and has been sent to Gov. Earl Warren for his signature.

AB 71 provides for the reinstatement without examination or penalty of anyone licensed under the Business and Professions Code within a year of discharge from military service. At the discretion of the licensing agency, an applicant may be required to pass an examination if application is filed more than one year after discharge from military service.

Any period of hospitalization in a veterans' facility subsequent to discharge and prior to application for reinstatement would be excluded from the one-year proviso. The bill stipulates that the license must be valid at the time of entering the armed forces. It requires that an application must be accompanied by an affidavit showing the date of entrance into the service, whether still in service, or date of discharge, and the renewal fee for the current license year in which the application is filed.

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In a series of experiments to evaluate the chick growth-depressing factor in alfalfa, Kodras, *et al.*, (*Poultry Sci.*, 30:28 [Mar.], 1951) fed ground alfalfa at 20% levels of the ration. Dehydrated, sun-cured, and shade-cured hay, harvested at various stages of maturity, were tested. In these trials, there was no essential difference in effect on rate of growth between alfalfa meals cured by any method tried.

The authors state that evidence points to the presence of one or more unknown factors in alfalfa meals which depress chick growth. They cite references that such negative effects were not observed by other workers when levels under 15% were fed and that the most satisfactory levels probably lie between 7 and 15%.

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Eight species of coccidia are reported to infest chickens and four occur in turkeys. Several of those listed as infesting chickens are now considered nonpathogenic and of little interest except as they confuse and cloud diagnosis. At least five species are pathogenic to a greater or lesser degree.

A.V.M.A. Convention, Milwaukee, Wisconsin, August 20-23, 1951

On every count, the 1951 A.V.M.A. meeting, to be held at the Auditorium in Milwaukee, Wis., August 20-23, will be the biggest convention of its kind ever held.

Here are just a few of the things that will make it big:

Expected registration of at least 2,500.

A tense world situation that imposes new responsibilities on the profession.

Scientific program featuring more than 75 speakers who will cover latest technical developments in every branch of the profession. In addition, there will be four hours of closed-circuit television dealing with anesthesia, surgery, laboratory technics, and diagnosis.

Record-breaking commercial and educational display. Sixty exhibit booths will be occupied by leading suppliers of professional products, plus a colorful array of educational exhibits sponsored by colleges, research agencies, and other organizations.

Nation-wide coverage of the meeting by the daily press, radio, and magazines, focusing attention of millions on the proceedings of the convention.

On the entertainment side, one of the headline events will be Veterinarians' Day at the Wisconsin State Fair — complete with fireworks, symbolizing the profession's contributions to the nation's welfare. Alumni dinners, president's reception and dance, golf tournament, and a special program for the ladies and teenagers will round out the social side of the convention.

Veterinarians who have not yet made hotel reservations for this meeting should do so immediately.

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Progress can come only from new and frequently daring hypotheses.

Courtesy Jour. Am. Vet. Med. Assn.

Airview of downtown Milwaukee. The Milwaukee River, serving the industrial area with lake shipping service, winds through the city, extending into an area of magnificent country estates.

Federal Poultry Grading Misleading*

The U. S. Department of Agriculture was accused recently of inspection, grading, and labeling practices in the marketing of poultry which are confusing to the industry and misleading to the consumer.

The charge was made by Oscar Sussman, D.V.M., M.P.H., Senior Public Health Veterinarian of the Division of Environmental Sanitation of the New Jersey State Department of Health. Doctor Sussman's charges followed a presentation of the Agriculture Department's policy by W. D. Termohlen, Chief of the Poultry Branch of the U. S. Department of Agriculture at a meeting of the U. S. Livestock Sanitary Association.

Not only is the Federal Department guilty of carrying on a program of confusion and uncertainty, Doctor Sussman said, but it adopted this program despite a formal protest adopted in 1948 by the State and Territorial Health Officers Conference which represents the State Commissioners of Health of the 48 states.

The Department recently instituted a new policy of grading eviscerated (ready-to-cook) poultry without inspecting it for disease or wholesomeness. The grading is based on the size of the fowl, the amount of meat on it, etc. It does not embrace adequate inspection for evidence of disease. A fowl could therefore carry a U. S. Department of Agriculture stamp as being of the highest grade and still be of questionable quality from the standpoint of human health. The consumer, not knowing of the difference between grading and inspection, would be likely to assume that since the fowl had been classed as high grade by the Department of Agriculture the meat must therefore be wholesome, in fact "ready to cook" and eat. Doctor Sussman went on to say that half-hearted attempts by the U. S. Department of Agriculture to overcome the objections of health officials have compounded the confusion.

Interestingly enough, while the USDA is willing to mislead "Mrs. Consumer" with regard to poultry, they are not willing to do so with regard to dog food. Regulations governing the use of the USDA shield on dog food, also provided for under a voluntary program, require a "compulsory inspection for wholesomeness."

Sussman also charged that the policy of the agriculture department has caused misgiving among at least three other federal agencies: the Army, the Food and Drug Administration, and the Public Health Service.

He suggested that the confused and undesirable features of the present program could be overcome by the simple method of having three clearly defined labels which would indicate the following: (1) inspected for wholesomeness but not graded for quality; (2) inspected for wholesomeness and graded for quality; and (3) graded for quality but not inspected for wholesomeness.

"I suggest," said Sussman, "that we sit down around a conference table and provide the industry and the consumer with an honest, workable, economical, and efficient plan to achieve uniformity of grading and inspection. A spade must be called a spade, an inspection, an inspection and not an examination. If there is a need for the inspection of red meat in interstate shipment, there is also a need for the inspection of poultry meat in interstate shipment. A federal law should be worked out which will provide for the compulsory inspection of all slaughtered poultry entering interstate commerce. Pending such a law, labeling provisions of the present program should be changed to eliminate the confusion which now exists."

*News release at the 55th annual meeting of the United States Livestock Sanitary Association, Phoenix, Ariz., Nov. 1-3, 1950.

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Opportunities for Graduate Training and Research for Veterinarians

The Department of Veterinary Science of the University of Wisconsin is preparing an exhibit for the A.V.M.A. convention in Milwaukee on August 20-23, 1951. The theme of the exhibit will be Graduate Training and Research for Veterinarians, and will stress the opportunities for and accomplishments of both the veterinary profession and the individual.

The exhibit will consist of four 3 x 6 foot panels on which 12 x 18 inch photographs or graphs illustrating selected phases of graduate training and research will be attached.

Deans of veterinary colleges and heads of veterinary science departments of schools in the United States, Canada, and Puerto Rico have been invited to participate in this venture. A list of graduate veterinary courses available will be displayed on a panel or included in reference books for perusal of visitors. Photographs, from thesis work or of facilities, lists of complete M.S. or Ph.D. degree theses, or other material of interest to those contemplating advanced study is solicited for inclusion in the exhibit.

Symptoms of Poisoning by Insecticides

The chlorinated hydrocarbon insecticides are convulsant poisons and cause a multiplicity of central nervous system disorders including excitation, hypersensitivity, tremors and twitching (either of the general musculature or of muscles of the eyes, eyelids, jaws, etc.), incoordination, choreiform movements, blindness, personality changes, tonic and clonic convulsions, and coma. In subacute and chronic poisoning, loss of appetite with consequent starvation may be prominent. Salivation is frequent, jaudice rare. At autopsy, acutely poisoned animals may show cyanosis, opisthotonis, and petechial hemorrhages or congestion in the central nervous system and in the viscera. These changes are the nonspecific result of convulsions and are not diagnostic. Particularly after chronic poisoning, autopsy may reveal the effects of starvation such as dehydration and emaciation. Microscopic examination of the liver and, to a lesser extent, of other organs may show a variety of degenerative changes which are due, at least in part, to the disturbance in nutrition. It is impractical, even for experts, to distinguish between these chlorinated hydrocarbon poisons by their effects on animals.

The organic phosphorus insecticides include parathion, tetraethyl pyrophosphate (TEPP), and others. They, too, are convulsant poisons but their action is specific through the inhibition of cholinesterase. Signs of poisoning are those characteristic of overstimulation of the parasympathetic nervous system. They include weakness, incoordination, muscular twitching, vomiting, sweating, myosis, tearing, salivation, cyanosis, convulsions, coma, and loss of reflexes and sphincter control. The pathology is not specific. However, cholinesterase determination done on blood (or on tissue taken at autopsy) reveals diagnostically low values in animals that are severely poisoned.

Sodium monofluoroacetate (1080) affects both the central nervous system and the heart. Convulsions and other neurological disorders are usually seen and may be the cause of death as in the dog. The heart may show various arrhythmias and a loss of contractile power leading to a fall in blood pressure. Death may be caused by cardiac dysfunction either before or after nervous signs become prominent. Autopsy findings are not specific.

ANTU causes marked pulmonary edema and hydrothorax in many species including dogs, horses, and swine. This results in cough, coarse rales, cyanosis, and death from asphyxia. Apparently, some species such as the chicken (which is highly resistant) show a nonspecific pathology.—*Russell Borgman, D.V.M., Department of Pathology, Kansas State College, Manhattan.*

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Information on the earnings of American men of science is reported by *Science*, 113:345 (Mar. 30), 1951.

The survey covered a large proportion of all Ph.D.'s in natural sciences, together with a small proportion of non-Ph.D.'s—presumably having equal scholastic training. Their median regular annual salary was $5,720. at the time of the survey (mid-1948). Colleges and universities were the largest employers of Ph.D.'s. This statistical information reflects the predominance of educational employment of those having advanced degrees and at once, the relatively low salaries received by faculty members. Industrial employment in all scientific fields is shown as most remunerative.

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A practitioner states that intramammary infusions of penicillin during the period that dairy animals are not in production has given him good results. By this method, plus good sanitation, mastitis is kept under control.

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The work of Trueta and others has removed much of the fear of "open joints" in veterinary practice. Successful surgical operations on the joints now are performed with impunity by veterinary surgeons. — *W. W. Armistead, D.V.M.*

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Lancaster, in England, reports good results with a vaccine prepared from cultures of *Spherophorus* (Fusiformis) *necrophorus* for the treatment of foot rot in both sheep and cattle. A dose of vaccine is given as soon as the condition is noticed; some cases require a second dose in seven days. One dose is reported to "clear up most cases."

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Catherine (Mrs. John Wesley) Patton, 58, East Lansing, Mich., died suddenly April 7, 1951, in Washington, D. C., where she had gone to see Doctor Patton leave for Indo-China, April 10. Mrs. Patton had planned to join her husband in Saigon in a few weeks. She is survived by her husband, two daughters, and three grandchildren. Interment was at Lansing.

PRINCIPLES OF ANIMAL HEALTH

R. R. DYKSTRA, D.V.M.
Manhattan, Kansas

Doll and Hull of the Department of Animal Pathology, University of Kentucky, report in detail, in *Cornell Veterinarian,* January 1951, about their research work in regard to hemolytic icterus in foals. Amongst other important points brought out in the report we find the following: "If the foal's erythrocytes were not agglutinated by the serum or colostrum, the foal could nurse safely. If the colostrum titer was 1:4 or less, the foal could nurse without serious danger of hemolytic icterus. If the colostrum hemagglutination titer was 1:8 or higher, it was necessary to remove the colostrum to prevent the development of anemia and icterus in the foal." A nurse mare or artificial feeding was resorted to if the dam's colostrum was unsatisfactory. "According to our experience during three foaling seasons, hemolytic icterus of foals from known sensitized mares may be prevented entirely. This was accomplished by establishing compatible breeding for the mare or by preventing the sucking of the mare's colostrum after the foals were born."

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Research has demonstrated that the albino rat is comparatively nonsusceptible to an intraperitoneal inoculation of human tubercle bacilli. On the other hand, the rabbit is highly susceptible to such an inoculation. In the Department of Medicine, Emory University, both albino rats and rabbits were given intraperitoneal injections of mineral oil in order to note any difference in the reaction to these injections. Rather significantly, the results were an intraperitoneal exudate in both, but in the rats it was very different from that in the rabbits. In the former the cellular response, as compared with the latter, is very rich in total cells, particularly of the mononuclear variety.

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In a report of a research project on experimental bovine udder infections with *Streptococcus agalactiae* by Lancaster and Stuart (*Vet. Rec.,* Feb. 24, 1951) it is concluded amongst other things that, "Results show that some cows were very susceptible to repeated experimental infections, over the period, while others were very resistant, and that in the majority of cows susceptibility increased with age or previous infection."

A short time ago we were called to examine a bunch of pigs two weeks of age, apparently spry, and no elevation in temperature. The only clinical symptom was clonus of the extensor and flexor muscles. Our diagnosis was "myoclonia congenita" (consult VETERINARY MEDICINE, May 1950, page 189). The condition has been variously named "dancing pigs," "trembles in pigs," "shivers in pigs," etc. In view of the fact that the condition has been observed on farms where pigs were the offspring of different sires, it is not considered hereditary. Efforts to produce the ailment by the use of various diets and combinations of foods has so far not been successful. The mortality rate is negligible, as most affected pigs recover spontaneously, under good care and sanitation, before they reach three months of age. Rare deaths follow very severe, continuous spasms, as a result of starvation.

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There are reports of deaths of persons allegedly the result of careless or incautious handling in the application of DDT in farm buildings. Others seem to be allergic to the chlorinated hydrocarbon insecticides with dire consequences to themselves. When used inside a building, if this is advised by a veterinarian, then it is incumbent on the practitioner to warn the person making the DDT application of the potential danger, and to guard against this by avoiding overexposure, usually by inhalation, by limiting the length of time of exposure, and by wearing a respiratory filter.

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A report by Becker, *et al.,* of Cornell University, regarding the toxicity of cobalt chloride administered to sheep at various dosage levels, indicates that sheep can tolerate 160 mg. of cobalt chloride per hundredweight daily for at least eight weeks, without noticeable harmful results. When the dosage was increased to 200 to 500 mg. daily per hundredweight there appeared severe inappetence and loss of weight.

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Milk exposed to direct sun radiation, or to comparable artificial light, provided the exposure is sufficiently prolonged, will acquire a "burnt sunlight flavor." The degree of this flavor depends on the length and the extent of the exposure.

POULTRY PRACTICE PROBLEMS

W. R. HINSHAW, D.V.M., Ph.D.
Frederick, Maryland

Those of you who are interested in poultry process plant sanitation will want to read the report by Goresline, *et al.*, in the April 1951 issue of the *U. S. Egg and Poultry Magazine*, page 12. Goresline and his coworkers have successfully used chlorine at the rate of 20 p.p.m. in the processing water for reduction of the bacterial count of eviscerated birds. Examples of the reductions obtained by using chlorinated water for washing are given below:

1. From 136,000 per sq. cm. to 4,000 per sq. cm. on the skin of dressed birds before chilling.
2. From 28,000 per sq. cm. to 2,000 per sq. cm. on chilled birds washed before evisceration.
3. From 17,000 per sq. cm. to 500 per sq. cm. on eviscerated birds washed and ready to pack.
4. From 2.5 million per ml. to 6,500 per ml. in water flowing from the mechanical washer.

The reduction in bacteria on plant equipment and working surfaces amounted to 90 to 99% when chlorinated water was used.

Flavor tests made on poultry immersed for several hours in water with a chlorine content of 100 p.p.m. showed no off flavors as a result of the presence of the chlorine.

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A number of chemical agents have been tested on Newcastle disease virus by Beamer and Prier, of the University of Illinois, (*Cornell Vet.*, 50:56, 1950), by five- and 30-minute exposures. The following chemicals were effective in inactivating the virus by exposure for five minutes: liquor cresolis compositus, 1:400; formalin, 2%; tincture of iodine, 1:100; Lugol's solution, 1:1,000; sodium hydroxide, 1:50; ethyl alcohol, 70%; potassium permanganate, 1:1,000; merthiolate 1:1,000; zephiran, undiluted; and Roccal 1:100. Formalin, 0.5% and 50% ethyl alcohol failed to inactivate the virus in five minutes but were effective after 30 minutes' exposure. Metaphen, undiluted hydrogen peroxide, and two unnamed quaternary ammonium compounds were ineffective even when the virus was exposed to them for 30 minutes.

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The guinea fowl is a native of Africa as is also the ostrich.

A new disease of ducks caused by a filtrable virus has been described by Levine and Fabricant (*Cornell Vet.*, 50:71, 1950). It is characterized by a high mortality and rapid death in young ducklings. Enlarged livers with hemorrhagic areas and swollen injected kidneys are described by the authors as the principal necropsy findings. The virus differs from Newcastle disease virus by its failure to agglutinate chicken erythrocytes, and it is not neutralized by the antiserum.

Live and formalinized vaccines made from egg-propagated virus were not generally effective in controlling natural outbreaks. Antiserums obtained from recovered ducks were successful in producing a high degree of protection against both the natural and experimentally produced disease.

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Loss in egg production and reduced egg quality have been attributed to a number of causes, including such diseases as infectious bronchitis, and Newcastle disease. Many of the sulfonamides also have been shown to affect both production and quality. Berg, Hamilton and Bearse (*Poultry Sci.*, 30:298, [Mar.], 1951) have added coccidiosis due to infection with *Eimeria maxima* to the list. They found that White Leghorn pullets infected with 800 sporulated oocysts suffered from a mild type of infection, but ceased production approximately one week after inoculation. They remained out of lay, however, for only seven to ten days, so the effect was not as great as in the case of Newcastle disease. Shell and interior quality likewise were only temporarily affected.

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The incubation period required for the eggs of birds to hatch varies from 14 days for most of the small land birds to 42 to 60 days for the ostrich. Some of the larger hawks require 28 days, the period also required for turkey and duck eggs. Chicken eggs require 21 days; pheasants from 21 to 26, and geese 35 days of incubation.

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The isolation of Newcastle disease virus from a 12-day-old nestling Starling (*Sturnus vulgaris*) is reported by Gillespie, Kissel and Fabricant (*Cornell Vet.*, 50:93, 1950).

PUBLIC HEALTH

JAMES H. STEELE, D.V.M., M.P.H.
Atlanta, Georgia

Leptospirosis

The increasing recognition of leptospirosis as an important public health and animal disease problem is apparent from the number of reports appearing in current literature and investigations now in progress. Formerly, all studies on this disease were concerned with *Leptospira icterohaemorrhagiae* in rats, but the incidence of recognized cases of *L. canicola* and other strains in man has extended the interest of many investigators to all animals. The Communicable Disease Center laboratory at Chamblee, Ga., reported between October 1 and December 31, 1950, on 26 sera which were positive for *L. icterohaemorrhagiae* and *L. canicola*. Titre ranged from 1:16 to 1:128,000. Low titres are insufficient basis for the diagnosis of disease unless it is observed to increase on subsequent tests. The results in this series of investigations are as follows*:

	L. icterohaemorrhagiae	*L. canicola*
1:128,000		1
1:64,000		
1:32,000	1	3
1:16,000	2	4
1:8,000	2	3
1:4,000	1	3
1:2,048	4	1
1:1,024	2	5
1:512	3	2
1:256	4	2
1:128	3	1
1:64	3	
1:32		1
1:16	1	
	26	26

The level of antibodies appears to be higher for *L. canicola* than *L. icterohaemorrhagiae*. There were three dog sera included in the above but their titres did not go as high as the human sera. The dog sera gave the following results:

	L. icterohaemorrhagiae	*L. canicola*
Dog 1	1:64	1:1,024
Dog 2	1:64	1:4,000
Dog 3	1:16	1:4,000

*Tests made by Dr. Martha Ward with formalized antigen prepared by Communicable Disease Center, Laboratory Services.

It would be assumed that the dog cases may be due to *L. canicola*. Among the 23 human sera, *L. canicola* titrated higher than *L. icterohaemorrhagiae* in 19 cases. These results make it apparent that the veterinary clinician has a greater responsibility than just treating the infected dog. He must advise the local health department that leptospirosis is being diagnosed in animals and that control procedures should be inaugurated. Control methods include reduction of stray dog population, rodent control campaigns and the confinement of all infected animals until it is ascertained that they are no longer carriers or shedders of the organism. The recognition of leptospirosis in cattle and the presence of *L. pomona* antibodies in man indicate that the problem is broader than formerly believed. The veterinarian can do much to assist in the recognition of this disease in man by acquainting his medical colleagues with the status and prevalence of leptospirosis in domestic animals.

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The Washington Department of Public Health has reported an outbreak of 17 human cases of trichinosis due to improperly prepared sausage made from pork which was traced to the Midwest. There are more cases of human trichinosis reported in the United States than any other country of the world. The most important practice in keeping the prevalence of the disease at high level in the swine population is the feeding of raw garbage. Public Health Service regulations prohibit the interstate movement of garbage which is to be fed raw to pigs but these regulations are ineffective unless supported by similar laws within the states. One of the big hog producing states to take such action recently, is Nebraska. They are to be congratulated on the adoption of a state-wide law prohibiting raw garbage feeding.

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Many state civil defense agencies are utilizing the veterinary practitioner as a part of the medical aid team during the first 72-96 hours following a disaster when medical aid is actually needed. The States of Washington, Colorado, Illinois, New Jersey and Florida have programs under development.

CLINICAL REPORTS

A Preliminary Report on the Use of the Brooks Paralysis Carriage*

E. I. BROOKS, D.V.M., Hatboro, Pennsylvania

During the past several years, the writer has noticed, with increased frequency, a condition in dogs marked by symptoms of posterior paralysis. There is no associated pain and the attitude of the animal is normal in every respect. Appetite is excellent and the general condition undergoes no change, with the exception of a severe atrophy of the muscles of the posterior limbs resulting from disuse. In several cases, a bowel or urinary complication exists due to a faulty nervous supply to the organs involved. These complications are an exception rather than a general rule.

These cases of paraplegia are confined mostly to the smaller breeds; usually seen in Cocker Spaniels and Dachshunds. The writer has never observed a case in the larger breeds.

History follows a set pattern. The animal apparently normal one day and then, seemingly overnight, staggering on movement, with complete paralysis of the posterior limbs developing within 48 hours. No apparent pain is associated with the paralytic symptoms and the dog seems content to drag itself around on its front legs. Roentgenograms reveal no pathology, and the writer has been diagnosing the condition as a toxemia with neurological involvement.

Brooks paralysis carriage providing support for the hind limbs of the paraplegic on the left. A second patient is shown in typical attitude on the right.

Treatment

Treatment has included the use of arsenical compounds along with strychnine, belladonna, iodides, salicylates, etc. In perhaps a dozen cases, intravenous administration of saline with 5% dextrose was resorted to in an attempt to overcome evident toxemia. In several Cocker Spaniels, 250 cc. of saline with 5% dextrose was given twice daily for periods ranging up to five days. No apparent benefit was noted. Two cases responded after 28 days and 33 days, respectively, of heat therapy (infrared rays) and hydrotherapy. Since muscle atrophy of the hind legs is marked, a need for exercise was indicated and some sort of sling-like arrangement or paralysis carriage was indicated to allow for support and also to encourage the animal to move around with its posterior legs elevated.

Paralysis carriages are not a new idea as custom-built carriages have been constructed by owners who wanted to keep their pets under any condition. Photos of them have appeared in newspapers from time to time. Kirk[1] and other authors have illustrated them. Since the cases vary in size, adjustability had to be considered, thus allowing a case to be fitted with a minimum of expense and effort. Adjustability was also a factor in order to allow for the raising and lowering of the carriage as the use of the muscles of the legs is regained. The need for a light carriage was noted because the animals usually range in weight from 14 to 30 lb., and hence aluminum was the metal of choice. Depending on the weight of the animal, either ¼ or ⅜ inch aluminum rods can be used.

*Patent applied for.

The accompanying photograph illustrates the adaptability of the carriage to patients and also illustrates adjustable features. The proper use of the carriage is important in that, at the beginning, when the animal is introduced into the carriage, the abdominal carrying support should be set high allowing the hind legs to dangle freely, yet not touch the floor. The weight of the legs has a tendency to improve the tone of the muscles and allow for some strengthening. Patients are kept in the carriage for an hour at a time and at least three times daily. It is suggested that, since the carriages are a new experience, the animal should be fitted at the hospital and kept there for about a week in order to acquire confidence in the device and lose any fear of it. When the animal is sent home, the owner will usually spend more time with it in an attempt to bring about improvement.

As progress is noted and the posterior legs develop some movement, the abdominal carrying bar is lowered so that more weight can be borne by the legs. This is continued until the animal is able to move around on all its legs and then the carriage is removed and the animal allowed to exercise (for brief intervals) under its own power. Under no condition should it be allowed to exercise excessively as fatigue of muscles must be avoided. The theory behind the use of the carriage approximates the use of orthopedic devices in human cases. When paralysis begins, there follows atrophy of muscles, which then weakens the entire leg. As the nerves regain function, the muscles are weakened to the point of not being able to support the weight. Forced use of the muscles is then indicated and in the majority of cases, improvement can reasonably be expected with the use of the carriage.

Case Reports

Case B2179. A two-year-old male, Cocker-Dachshund mixture developed paralysis suddenly on June 14, 1950. The animal was given a cathartic. Fowler's solution in ascending doses was prescribed for home treatment. Strychnine and arsenic tablets also were given at a later date along with vitamin B complex, but no improvement was observed. The animal was fitted in a carriage on December 18, and exercised forcibly. Three weeks later, it was noticed that the animal was using its hind legs in a swinging fashion and the abdominal bar was lowered to allow legs to contact the ground. Dog then used its legs for walking.

Case B3410. A two-year-old Cocker Spaniel was presented with the same history as the preceding case and became paralyzed on November 28, 1950. Intravenous saline was administered and magnesium sulfate given to effect a thorough cleaning of the bowel. No improvement was noted for three months, at which time the animal was fitted with a carriage. This dog is now showing definite signs of using its hind legs.

Conclusion

1. Medicinal treatment has proved of no avail in these cases of toxic, flaccid paraplegia.

2. Systemic symptoms are not present in this condition.

3. Use of an adjustable paralysis carriage is indicated for the prevention and treatment of atrophy of the muscles involved.

4. The weight of the carriage does not interfere with the animal and its ability to move about.

5. The adjustable features of the carriage allow for three dimensional manipulation and also for varying the size of the carriage to fit dogs of varying size.

6. The carriage will be available to veterinarians only for use in selected cases where it may prove of value.

7. The carriage is not a panacea for all cases of posterior paralysis. It may prove useful only in those of sudden onset in which traumatic or other lesions are not demonstrable and in those exhibiting symptoms of muscular atrophy.

REFERENCES

1. Kirk, Hamilton, Index of Treatment: Canine and Feline, Baltimore, The Williams & Wilkins Co., 1948, p. 516.

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Superfetation or Delayed Parturition

On Sunday, March 18, 1951, a grade Guernsey cow, six years of age, gave birth to a normal, active, heifer calf. On the following Tuesday evening, the owner observed what appeared to be a vaginal prolapse and fashioned a makeshift harness to prevent further expulsion.

I was first called on the case on Wednesday afternoon, at which time the cow had a complete prolapse of the vagina, which was reduced and secured by tape sutures. At this time the cervix was noted to be closed. On Tuesday of the following week, 17 days after the birth of the first calf, the owner hurriedly cut the tape sutures and called me. On arrival, a second calf was being presented; on delivery found to be normal in every respect.—*Paul J. Doran, D.V.M., Weedsport, N. Y.*

BOOK REVIEWS

Books reviewed in this department and any other books, if available, may be obtained by remitting the published price to the Book Department, Veterinary Medicine, Suite 803 Livestock Exchange Building, Kansas City 15, Missouri.

DIAGNOSTIC METHODS IN VETERINARY MEDICINE, by *George F. Boddie,* B.Sc., M.R.C.V.S., F.R.S.E., Professor of Medicine, Royal (Dick) Veterinary College, Edinburgh, Scotland, with a chapter on Clinical Hematology by *H. H. Holman,* D.Sc., Ph.D., M.R.C.V.S., Pathologist, Agricultural Research Council, and a chapter on Diagnosis of Poultry Diseases by *J. G. Campbell,* F.R.C.V.S., Royal (Dick) Veterinary College. Third edition. 389 pages, 50 illustrations and four full-page color plates. Oliver and Boyd, Edinburgh, publishers, 1950.—Price (delivered in U.S.), $4.00.

In the review of the first edition of this work (*Vet. Med.,* 39:362 [Sept.], 1944), its worth was apppraised in this sentence: "It is a very satisfactory and useful work; a great improvement upon the text which has had a monopoly in this field in American veterinary literature for two score years." In the review of the second edition (*Vet. Med.,* 42:199 [May], 1947), it was recorded that a new chapter, Diagnosis of Poultry Diseases, had been added. The present edition contains still another chapter titled, Clinical Biochemistry.

The text is divided into 20 chapters: the subjects being; introduction, preliminary examination, digestive system and abdomen, respiratory system, circulatory system, urinary system, nervous system, skin, lymphatic system, sense organs, genitalia and mammae, allergic reactions, collection of material for laboratory examination, clinical biochemistry, clinical bacteriology, clinical helminthology, clinical hematology, postmortem technic, and diagnosis of poultry diseases. Three short appendices include: synopsis of case recording, notifiable diseases, and incubation periods. This arrangement, combined with a comprehensive index, enables the reader to find any particular item of information quickly.

A few random sentences from the introduction indicate the author's sound approach to the subject, which obtains throughout the text:

"The basis of the study of clinical methods must be a sound knowledge of anatomy, physiology, and pathology, as well as an intimate acquaintance with the appearance and behavior of the animal in normal health.

"Only when he has become familiar with the normal animals that are to be his patients, should the student turn his attention to the abnormal.

"The service of preventive medicine to the community entails the control of epidemics and the prevention of their development by means of the provision of immunity where possible, and by means of hygienic and veterinary police measures."

Note that among disease control measures, immunization, where possible, comes before hygiene, quarantine, sanitation, etc. The teaching is at least a generation in advance of the knowledge of some of our official disease controllers, which is limited to skill in the use of a repeating rifle or the whereabouts of the nearest abattoir.

"The clinical examination of the patient may, in many cases, reveal the nature of the malady from which the animal is suffering, but in other cases it is necessary to employ one or more of the various aids to diagnosis that are available."

Note that in the author's view the laboratory does not make diagnoses; its sole function being to assist the clinician, the only exception to this being the role of the laboratory in the detection of disease carriers.

"In any allergic reaction there are three variable factors; the diagnostic agent, the individual applying the test, and the animal to which the test is being applied. If the technic of the test is standardized, gross variations should not occur, but minor variations must inevitably appear.

"It will readily be appreciated that in allergic tests an accuracy approaching 100% cannot be expected, but a standard of accuracy sufficiently high for all reasonable practical purposes can be obtained provided the variable factors are realized and allowance made for them."

Which is just another way of saying that the interpretation of an allergic reaction requires training and skill, a knowledge of the history of the herd, the environment and the concomitant circumstances, *i.e.,* it cannot be by rule of thumb.

The discussion of the newer tuberculin tests —single intradermal, double intradermal, com-

parative intradermal—both single and double, ophthalmic, and cutaneous—is excellent and comprehensive. The discussion of the subcutaneous or thermal tuberculin test leads this reviewer to suspect that in this case the author is not writing from personal experience since the old cliches, *e.g.*, the animals must be housed throughout the test, the parturient cow is not a suitable subject for the test, and animals in the latter stages of the disease will not react, are all paraded again. Such statements were widely current 40 years ago, but no convincing basis for them was ever supplied so far as this writer is aware. Certainly turning cattle out of the stanchions or from crowded housing every few hours during a test in his experience did not lessen the accuracy of the test, quite contrary in the case of nervous animals unaccustomed to housing. If the stanchion be regarded as a pillory, the reason is fairly obvious. Also he has tested two cases of far advanced generalized tuberculosis; animals unable to get upon their feet unaided. In both cases fairly normal positive reactions occurred. In testing around the calendar, not an inconsiderable number of cows were tested on the day of normal parturition and probably some hundreds within ten days of that event. No effect on the accuracy of the test due to normal calving nor imminent nor recent normal calving was observed.

Some of those minor annoyances, almost unavoidable in first editions but usually absent from third editions, persist in this one. For example, the use of "postparturient" for postpartum; pluralizing abbreviations, as "mgs.", and lack of uniformity in not pluralizing "cc." Of course, it is the lack of uniformity, not the correct use of cc., that constitutes the minor annoyance.—*D.M.C.*

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INHERITANCE IN DOGS, by *Ojvind Winge,* Dr. Phil., Professor, Carlsberg Laboratories, Copenhagen, Denmark (Translated from the Danish by Catherine Roberts, Ph.D.). 153 pages, 46 diagrams, 5 colored plates. Comstock Publishing Co., Inc., Ithaca, N. Y., publisher, 1950. —Price $3.50.

Few breeders consciously look at their animals in the light of their genes. At the same time, most appreciate the advantage of homozygotic animals and the stability of inheritant characteristics resulting from inbreeding.

The author of this book, a Danish geneticist of international repute, has presented a highly technical subject in an interesting and understandable fashion. The first part of the book discusses general principles of heredity; the second part is devoted to inheritance of coat color in a few specific breeds of dogs.

The dog has become one of the most varied species of animals on earth, the smallest specimen weighing only a fraction of the largest. There are fantastic extremes of color, shape, type of hair coat not seen in any other species. For this reason, the development of breeds and inheritance in dogs offers endless opportunity for study and experiment. For one who has the courage to disregard prevailing dogmas, many new characteristics might still be fixed in a favorite breed.

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VETERINARY OBSTETRICS, by *Frank Benesch,* M.D., Professor of Obstetrics and Director of the Obstetrical Clinic in the Veterinary High School, Vienna, and *John G. Wright,* F.R.C.V.S., Professor of Veterinary Surgery at the University of Liverpool; formerly, Professor of Surgery, Royal Veterinary College, London. 459 pages, 243 illustrations. Cloth bound. The Williams & Wilkins Co., Baltimore, publishers, 1951.—Price $9.50.

The scope of this book has been so enlarged that, to all intents and purposes, it appears as a new work; its title is the same as that published in 1938. (See VETERINARY MEDICINE, 34:197 [Mar.], 1939.)

The original work was published by Doctor Benesch (English edition edited by John G. Wright) 17 years ago. Since, it has occupied an enviable position as text and reference on the science of veterinary obstetrics in horses and cattle. Now, a new edition, the need for which has been apparent for some time, has been expanded to cover new material in reference to farm livestock and also subject matter on small animal obstetrical practice.

The text is divided into three parts. The first and third are Professor Wright's additions, which have increased the size of the book to more than twice that of the earlier work.

Part I (chapters 1 to 9) deals with the physiology of reproduction and normal process of parturition. An explanation, with illustrations—instructive schematic drawings, is given of the estrus cycle in domestic and pet animals. Detection of pregnancy in various species follows—to provide background for the discussion of dystocia.

Part II of the book (chapters 10 to 27) consists of the whole of Doctor Benesch's original volume, including the many excellent

illustrations and drawings which give clarity to the text material on the treatment, by vaginal manipulation, of bovine and equine dystocia.

In Part III (chapters 28 to 39) cesarean section, which has become an established surgical procedure, is introduced. Surgical details are applied to each of several species in separate chapters. Retention of fetal membranes and the problem of infertility, which constitute such an important aspect of the work of the veterinary practitioner, are discussed also in this section.

As a whole, the book is distinguished by its intelligibility. The explicitness of presentation is graphic and impressive. It should, without doubt, find equal or better acceptance among practitioners and teachers than was extended the original work. It is certain to please the reader and serve as a reference for practicing veterinarians and students of veterinary obstetrics.

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LEHRBUCH DER TOXICOLOGIE FUR TIERARZTE, by *Eugen Fröhner,* revised by *Prof. Dr. Richard Völker.* Sixth edition. 404 pages. Ferdinand Enke, Hasenbergsteige 3, Stuttgart, W. Germany, publisher.—Price 35 marks (about $9.40).

This is a valuable standard book for practicing veterinarians, one of the relatively few German publications which should be translated into English so that it may be made available to those who cannot read the original text.

What distinguishes this volume from others is not its introductory General Toxicology, but the first two chapters of its Special Toxicology, dealing in a thorough manner with inorganic and organic compounds; followed by chapters on poisonous plants and animals, some of them not common in America. Numerous chemicals described as poisonous are briefly set forth as to their chemistry, etiology, pathogenesis, symptoms, autopsy findings, treatment, detection (chemical reactions), and literature references. Among the hundreds of poisonous substances mentioned, not only are the well-known arsenic, lead and thallium compounds listed, but also uranium, radium, and many of the most valuable pharmaceuticals, disinfectants and insecticides which so often cause embarrassment if certain precautions are not considered and specific antidotal measures not taken when needed. This is true of such well-known drugs as tetrachlorethylene, ether, chloral hydrate, sulfonamides, barbiturates, DDT, etc.—*R.S.*

Superb Boy and Dog Story

Everyone loves or should love boy and dog stories, which are legion. This reviewer has not read them all or seen all of them, but so far as his experience goes, That Useless Hound is the choice*.

It begins with a boy of a dozen years, Dave Ward, just returned home from a hospital. He is recuperating from an attack of polio, which has left him with one paralyzed leg. His father is superintendent of a southern prison camp and Dave's associates are chiefly "trustees," with whom he is a great favorite.

The camp maintains a pack of Bloodhounds which are used to chase escaping prisoners. One day the best of the pack whelps on a chase. The bitch succumbs, but one puppy survives. Dave raises and later trains it. The exercise incident to training the hound ultimately brings about considerable improvement in Dave's injured leg.

Dave will not permit his hound to be used in hunting escapees and on that account it is called "Useless" by both prisoners and keepers.

Useless, however, is well trained according to the directions given in a scientific book on the subject and soon distinguishes both himself and Dave by finding lost children. In time, the fame of the two spreads and their services are in demand all over the state. Two of the trustees, Dave's special friends, have helped him all through his prolonged convalescence, the training of Useless, and the spectacular child rescues. Their names are Abe and Shorty. One such rescue attracts the attention of the governor of the state and wins a well deserved pardon for Abe and Shorty, and at the same time supplies the happy ending.

This delightful story illustrates another facet of the versatile Doctor Whitney of Orange, Conn. Why do we call him versatile? Here are some, but not all of the reasons: He conducts the most extensive private veterinary practice in the New England states; he collaborates with Yale University in cancer research, which requires much of his time; he publishes articles frequently in the leading women's and general magazines; he writes on the average of a book a year; is a leading breeder of Bloodhounds and supplies them to many police departments all over the country; and he is one of a triumvirate of the mightiest coon hunters this country has produced, the other two being Dr. A. J. Durant, Columbia, Mo., and the late Daniel Boone, also formerly of Columbia, Mo. —*D.M.C.*

*That Useless Hound by Leon F. Whitney, D.V.M., published by Dodd Mead & Co., New York; price $2.50.

ABSTRACTS OF LITERATURE

Leukosis Not Transmitted Through Eggs

In their experiments with chicken strains highly susceptible to leukosis, the authors demonstrate that mortality in chicks hatched from eggs of such susceptible strains was practically nil when they were reared in isolation[19].

Chicks raised on clean premises were of a strain so highly susceptible that in those exposed to natural infection deaths from leukosis exceeded 58%. Among 280 pullets reared in isolation, only one bird developed the disease during 160-day observation periods in experiments extending over two years. This in spite of the fact that they were held in the hatching compartments for 18 to 20 hours beyond the hatching period. If the virus causing leukosis were transmitted from hen to chick through the egg, or if any chicks were infected in the incubator, there should have been serious losses whether exposed to the disease at a later date or not.

Development of further resistant strains and isolation offer the poultryman a practical method of control. The evidence in this work offers no support for the theories of disease transmission through the egg or dissemination in the incubator.

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Brucella Reactors in Slaughter Cattle

It will be no surprise to readers that some groups cling to a past prevalent view that brucellosis infection and organisms that cause it are found mainly in the udder, uterus and other organs of the urogenital tract. It long has been known that infection is widely distributed in affected animals early in the disease course. This is particularly true of young infected stock.

In studies to determine if Brucella reactor carcasses of slaughter cattle might be a source of human exposure, workers of the University of Chicago[20] report a study on a variety of tissue collected on the killing floor from known positive cattle.

Samples were taken during various stages of the dressing operation. Blood samples were taken at bleeding, and tissues obtained from accessible lymph nodes, liver, spleen, and others. Of 100 carcasses so examined, *Brucella abortus* was recovered from one or more areas in 42 animals.

All animals were positive reactors; 80% gave titers of 1:640 or higher. Recoveries of organisms were made more consistently in animals with high titers. Titers of 1:2,560 or higher occurred twice as frequently in these cattle from which *Br. abortus* was recovered as in culturally negative animals. There appeared to be no relationship of pregnancy to blood titer. Failure to recover organisms from 58 carcasses is understandable since animals sent to slaughter represented those with chronic, long-term infections and which were no longer profitable producers. In such cases as these, infection may be localized.

This report emphasizes the significance of beef carcasses as a potential source of human brucellosis for personnel engaged in the processing of reactor cattle.

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Ca:P Ratio in Canine Distemper

Calcium-phosphorus ratio in the blood of dogs showing symptoms of generalized distemper infection was noted as 2.02[19]. When nervous involvement was manifested, the ratio dropped to approximately 1.4. Early administration of 10 cc. of 10% calcium gluconate solution and 2 cc. of vitamin D_2 solution, the latter containing 0.5 mg. D_2 per cc., is reported to prevent the development of complicating nervous symptoms if given early in the disease course. It is suggested that the treatment should be repeated in ten days.

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Intraperitoneal Chloral Hydrate Narcosis of Swine[6]

Satisfactory anesthesia for ovariotomy in small sows, 4.1% (isotonic) to 5% chloral hydrate solution can be injected intraperitoneally, but the dose must not be larger than 1.75 gr. per lb. body weight; for small animals it should be even less (1.4 gr./lb.). Just before use, the solution should be warmed to body temperature.—*R.S.*

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[19]Cole, R. K., and Hutt, F. B., Evidence That Eggs Do Not Transmit Leucosis. *Poultry Sci.*, 30:205 (Mar.), 1951.

[20]McCullough, Norman B., Eisele, C. Wesley, Byrne, Anne F., Incidence and Distribution of *Brucella abortus* in Slaughtered Bang's Reactor Cattle. *Pub. Hlth. Repts.*, 66:341 (Mar. 16), 1951.

[19]Neuhaus-Lennep. *Deutsch. Tieraerztl. Wochschr.*, 57:269, 1950.

[6]Bauer, H. R., *Tierarztl. Umschau.* 5:366, 1950.

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VETERINARY ITEMS OF INTEREST

The nature of food intake is of primary importance in any disease condition affecting the kidneys.

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The trend toward intramedullary pinning of fractures in long bones of pet animals is advancing rapidly. Pins designed to prevent rotation are gaining in favor.

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The eye of the dog presents a more difficult surgical field than does the human eye. Structures through which incision must be made for cataract removal, as an example, are tougher and the lens is more firmly attached. —*W. G. Magrane, D.V.M.*

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Adverse weather conditions have been cited by the BAE as resulting in fewer marketable lambs this spring. Strong demand for breeding stock is also a factor in reduced supply of slaughter lambs.

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The Commodity Credit Corporation (CCC) is reported to have sold 25,000,000 lb. of dried eggs from its stocks for export to Great Britain. The price received was not given in the report available. This reduces remaining stocks to about 42,000,000 lb., or about one-half the quantity bought for the 1950 price support program.

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Canners of dog food will not be permitted to use more tin in the second quarter of 1951 than 75% of the amount used during the like period in 1949 or 1950, whichever was agreed on as a basis.

More stringent cutbacks are expected since the announcement by the National Production Authority (NPA) that many non-essential items now packed in tinned cans will be out of such containers by year end.

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By flushing the uterus of cows with physiological solutions, fertilized ova have been recovered nine times in a series of 19 experiments. In two of the 19 trials, superovulation was induced, ten ova were recovered from one cow, and two from another.

Dracy and Petersen (Proc. Natl. Egg Trans. Breed Conf., Apr. 14, 1949) suggest the possibility of utilizing this process as a method for isolating fertilized ova from the living cow.

The numbers of cattle and sheep in New Zealand have shown a steady increase for the past six years.

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A fluctuation in activity of any one ductless gland may so alter the balance of endocrine forces as to result in definite manifestation of metabolic disease.

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Iowa has a larger number of beef cattle and hogs per square mile than any other state. USDA report ranks the states in density of cattle population as follows: Iowa, Nebraska, Kansas, Illinois, and Missouri.

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The domestic fowl originated from the jungle fowl (*Gallus bakiva*), a native bird of India. The domestic peafowl also originated from India and is the descendant of an Indian wild peafowl (*Pavo cristatus*).

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Concern is expressed by officials of the Republic of the Philippines because the number of veterinary students is so small—now sufficient only to provide little more than replacements for those who are retiring.

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Heading a list of prevalent and contagious animal diseases existing in Greece, is anthrax. The number of animals (all species) attacked in 1946, the latest statistics available, was 16,766, practically all of which died. This may be compared to losses reported due to this disease in livestock in the United States. Only 12 states report any loss. Those reporting give figures that totaled 595 head (all species) lost during 1950.

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Continuous medication at very low dosage levels has necessitated drug treatment of feed as the most practical approach to the control of coccidiosis in chicks. In addition to requirement for daily low dosage over an extended period, effective agents are insoluble in water. This has been a wedge allowing a degree of extension of medication in feed which is considered to be inadvisable.

The growing tendency to enlarge on the practice is unfortunate since good sanitation practices, which are basic to disease prevention, are being sacrificed by an increasing number of producers.